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Outdoor Education's Relationship to Adolescent Behavior and Academic Performance in Two East Texas Middle Schools

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By

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Outdoor Education's Relationship to Adolescent Behavior and Academic Performance in Two East Texas Middle Schools

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ABSTRACT

Historically, a key part of a child's development was their exposure to and relationship with the world outdoors – nature. The current movement to promote the inclusion of environmental and outdoor education into curricular and extracurricular activities stems from the mounting evidence that experiences in the outdoors may improve a child's behavior and mood, as well as improve their academic performance. This mixed-methods study hoped to discover whether or not, on average, children improve their academic performance and/or their individual behavior in school when provided with outdoor education learning experiences. The mindset used in outdoor education research may have to change as the results of this study showed that children typically spend more time outside than the literature shows. The children in this study although they want to utilize their phones and other technological devices more regularly still spend a rather abundant amount of time outside engaged in free play and exploration. This indicating that our perceptions of how the current generation may be biased and inaccurate.

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TABLE OF CONTENTS

ABSTRACT i

ACKNOWLEDGEMENTS ii

TABLE OF CONTENTS iv

LIST OF TABLES vi

INTRODUCTION 1

STUDY OBJECTIVES 5

LITERATURE REVIEW 6
- Biophilia 7
- Physical Benefits of Nature 8
- Psychological Benefits of Nature 11
- Cognitive Benefits of Nature 13
- The Importance of Nature and Outdoor Play for Children 15
- Curriculum 17

JUSTIFICATION 20

METHODS 21
- Study Sites 22
  - *MCMICHAEL MIDDLE SCHOOL* 22
  - *MIKE MOSES MIDDLE SCHOOL* 23
- Methodology 24
  - *GRADE AND BEHAVIOR DATA COLLECTION* 25
  - *INSTRUMENTATION* 25
  - *QUANTITATIVE DATA* 27
  - *QUAITATIVE DATA* 28
  - *CLASS DOJO* 29
- Return Rate 30
- Reliability Analysis and Statistical Analysis 31

LIMITATIONS AND BIASES 33
- Other Considerations 34

RESULTS 35
Demographics 35
Group and Connection to Nature 36
Gender and Connection to Nature 39
Race/Ethnicity and Connection to Nature 41
Relationships between Groups and Academic Performance 44
TOTAL SAMPLE RELATIONSHIP TO ACADEMIC PERFORMANCE 44
MIKE MOSES SAMPLE RELATIONSHIP TO ACADEMIC PERFORMANCE 49
MCMICHAEL RELATIONSHIP TO ACADEMIC PERFORMANCE 54
Variable Interactions 59
Qualitative Analysis 61
PRE, POST, AND PARENTAL OPINIONS 61
CONNECTION TO NATURE MEASURE THEMES 67
BEHAVIOR DATA 69

DISCUSSION 73
Connection to Nature 73
GROUP AND CONNECTION TO NATURE 74
GENDER AND CONNECTION TO NATURE 77
RACE/ETHNICITY AND CONNECTION TO NATURE 77
Relationship to Academic Performance 78
Relationship to Behavior in School 79
Qualitative Data Themes 80
Limitations and Recommendations 81

CONCLUSION 83

REFERENCES 84

APPENDICES 92

VITA 123

LIST OF TABLES

Table 1. Connection to Nature measure whole population comparison of groups 37

Table 2. Connection to Nature measure data comparison for the Mike Moses only groups 38

Table 3. Connection to Nature measure data comparison for the McMichael only groups 38

Table 4. Connection to Nature measure whole population comparison of genders 39

Table 5. Connection to Nature measure Mike Moses comparison of genders 40

Table 6. Connection Nature measure McMichael comparison of genders 41

Table 7. Connection to Nature measure whole sample comparison of students of color and white students 42

Table 8. Connection to Nature measure Mike Moses comparison of students of color and white students 43

Table 9. Connection to Nature measure McMichael comparison of students of color and white students 44

Table 10. t-test for whole sample 1st six weeks grades comparison by group 45

Table 11. t-test for whole sample 2nd six weeks grades comparison by group 46

Table 12. t-test for whole sample 3rd six weeks grades comparison by group 47

Table 13. t-test for whole sample semester grades comparison by group 47

Table 14. t-test for whole sample semester grades comparison by gender 48

Table 15. t-test for whole sample semester grades comparison of students of color and white students 49

Table 16. t-test for Mike Moses only 1st six weeks grades comparison by group 50

Table 17. t-test for Mike Moses only 2nd six weeks grades comparison by group 51

Table 18. t-test for Mike Moses only 3rd six weeks grades comparison by group 52

Table 19. t-test for Mike Moses only semester grades comparison by group 52

Table 20. t-test for Mike Moses only semester grades comparison by gender 53

Table 21. t-test for Mike Moses only semester grades comparison of students of color and white students 54

Table 22. t-test for McMichael only 1st six weeks grades comparison by group 55

Table 23. t-test for McMichael only 2nd six weeks grades comparison by group 56

Table 24. t-test for McMichael only 3rd six weeks grades comparison by group 57

Table 25. t-test for McMichael only semester grades comparison by group 57

Table 26. t-test for McMichael only semester grades comparison by gender 58

Table 27. t-test for McMichael only semester grades comparison of students of color and white students 59

Table 28. Results of two-way ANOVA for variable interactions on connection to nature scores 60

Table 29. Results of two-way ANOVA for variable interactions on grades 60

Table 30. Themes from Pre, Post, and Parental opinion surveys 62

Table 31. Comparison of themes between outdoor education and technology/keyboarding students 66

Table 32. Themes from connection to nature measure open-ended questions 68

Table 33. Observations during site visits for survey administration 69

INTRODUCTION

The generations prior to Generation Z (Gen Z born after 2001) grew up seemingly with greater opportunity to play outside and lacked the standard of technology that is seen today (Clements, 2004; Davison & Lawson, 2006; O'Keefe & Clarke-Pearson, 2011; Larson, Szczytko, Bowers, Stephens, Stevenson, & Floyd, 2018). They spent their time regularly playing imaginative or made-up games with their friends that involved active movements and open spaces (Clements, 2004). The advances in technology and access to entertainment seen in the last two decades have transformed how play is conducted by children (Pretty, Peacock, Sellens, & Griffin, 2005; Davison & Lawson, 2006; O'Keefe & Clarke-Pearson, 2011; Silverman & Corneau, 2017). These advances have transformed play from a predominantly outside activity to an indoor activity utilizing technology as the medium. In comparison to the previous generations, Gen Z has developed more sedentary lifestyles (Davison & Lawson, 2006; O'Keefe & Clarke-Pearson, 2011; Silverman & Corneau, 2017). This is not to say that technology is a detriment to child development, however outdoor education and experiences in nature have shown to have many positive impacts on child development in comparison (Greenleaf, Bryant & Pollock, 2013; Pretty et al., 2005; Davison & Lawson, 2006; O'Keefe & Clarke-Pearson, 2011; Silverman & Corneau, 2017). Such benefits are the development of leadership skills, teamwork skills, sportsmanship ideologies (Cooley, Cumming, & Burns, 2013), social skills, skills for future opportunities, improvements to behavior, and

an improved quality of life (Kuo, Browning, & Penner, 2017; Silverman & Corneau, 2017; Keniger, Gaston, Irvine, & Fuller, 2013; Collado, Staats, & Corraliza, 2013; Mitchell, & Popham, 2008). Increasing urbanization has been thought to be one part of the reason for the disconnect of children from nature along with a fear for safety, access to natural areas, and technology being the new medium for play (Gullone, 2000; Greenleaf, Bryant & Pollock, 2013; Pretty et al., 2005).

As technology has risen so has social and psychological disorders seen in Gen Z (Gullone, 2000; Greenleaf, Bryant & Pollock, 2013; Keniger et al., 2013). These social and psychological disorders have taken the form of depression, social anxiety, societal detachment, ADD, and ADHD (Kuo & Sullivan, 2001; Leather, Pyrgas, Beale, & Lawrence, 1998; Lee & Maheswaran, 2011; U.S. Department of Interior, 2018; Weinstein, Przybylski, & Ryan, 2009). Psychologists and marketing firms are seeing a relatively new phenomenon coinciding with the growth of these psychological disorders addressed as “eco-fatigue” (Marris, 2007; Preece & Preece, 2015). Eco-fatigue is defined as an uncaring attitude towards environmental stewardship from the oversaturation of environmental issues through media throughout the course of their childhoods (Delaney, 2005, p. 152). Many Gen Z children are actually quite knowledgeable about environmental subjects, such as, climate change, global warming, and pollution; however, they take an apathetic stance towards these issues from their display over the internet, social media, news channels, and various other forms of media (Freeman, 2012; O’Keefe & Clarke-Pearson, 2011).

This disconnect often demonstrated by Gen Z has been coined as "Nature-Deficit Disorder" (NDD) by Richard Louv (2008) in *Last Child in the Woods*. NDD is not a diagnosable mental disorder. Instead, Louv (2008) uses NDD as a metaphor for a mental health condition resulting from a deprivation of self-expression. For clarity, self-expression is defined as the feelings and ideas that a person creates through exploring their surrounding world in a natural environment (Dickinson, 2013). By contrast, ADD/ADHD, recognized as an educational hindrance, create a mental block causing a child to have trouble focusing on subject matters and retaining the information discussed (Biederman, Monuteaux, Doyle, Seidman, Wilens, Ferrero, ... & Faraone, 2004). NDD is thought to be a block in a child's academic performance and behavior through a lack of outlets to expend energy in free expression in a natural environment, and may create similar symptoms to ADD/ADHD (Soga, 2016; Clements, 2004; Kaplan & Kaplan, 1989; Kuo et al., 2017).

From the recognition of NDD as an issue, research into the potential of outdoor education (OE) to offset NDD has emerged. Evidence shows quantifiable benefits received from exposing oneself to more natural or green areas, such as a city park (Bowler, Buyung-Ali, Knight, & Pullin, 2010; Pretty et al., 2005). Some of these benefits have included stress relief, psychological health benefits, and physiological benefits (Keniger et al., 2013; Cheng, Shaw, Monaco, Hoffman, Sozda, Olsen, & Kline, 2012; Bowler, Buyung-Ali, Knight, & Pullin, 2010; Pretty et al., 2005). However, there is still little data supporting a direct or indirect relationship between outdoor education and improvements in these areas. As

this type of applied research is still relatively new, this project is essential in finding if there is a relationship between outdoor education and academic performance and classroom behavior.

STUDY OBJECTIVES

1. Determine if students enrolled in an outdoor education elective course have higher academic performance, on average, than students who are enrolled in a technology/keyboarding elective course based on their six week report cards.
2. Determine if there is a relationship between the number of office referrals and overall behavior between students enrolled in the outdoor education course compared to students who are enrolled in a technology/keyboarding elective course.
3. Identify if there is a higher level of nature connectedness by students enrolled in an outdoor education elective course in comparison to students enrolled in a technology/keyboarding elective course.
4. Identify if the relationship, if any, between outdoor education and academic performance and behavior is consistent between school campuses
5. Identify any common archetypes amongst the opinions of students on outdoor education and the environment.

LITERATURE REVIEW

Long before this technologically-advanced era in which humans now live in humans lived side-by-side with nature. Many different cultures survived and lived through different means like farming, hunting, and fishing. Even to this day some cultures still engage in these practices as a means of survival. Humans survived by utilizing the resources that were available in nature and wasting as little as possible (Gullone, 2000). As time passed, humans became more advanced and some live in comfort, but have lost their connection with nature (Gullone, 2000; Louv, 2008). Now that humans no longer need to hunt, fish, etc. to survive in more developed parts of the world they have become sedentary in comparison with only small portions of the population practicing these skills. With each passing generation and increased urbanization, our access to nature has been cut significantly and symptoms related to this disconnection have started to manifest in many forms, such as ADHD, depression, obesity, and other health concerns.

The effects nature and the natural world have on people can be broken down into different categories of benefits (Keniger et al., 2013; Cheng et al., 2012; Bowler et al., 2010). For this study, the benefits that are associated with nature will be categorized in three ways: physiological,

psychological (behavior), and cognitive (mental functions) benefits. All three of these categories are derived from what was once a natural development through the connection to nature humans had. Signs point towards children developing sedentary lifestyles from sitting at school all day with few physical activity breaks and then continuing this sedentary lifestyle at home with television, social media, and video games (Clements, 2004).

Biophilia

Humans are not designed for a sedentary lifestyle. Analytical psychologist Carl Jung spoke of a “profound emotional energy” that humans share with the world around them feeling as if they are one with the world (Jung, 1964 as cited by Schroeder, 1996). Along this thought, evolution has many definitions to describe the process of change that organisms experience to adapt from generation to generation. Each generation genetically gains something from the previous generation whether it be a physical adaptation or even instinctual. E. O. Wilson (1984) theorized the idea that as humans have evolved and adapted to the changing environment they have coevolved with nature itself developing a need for it. Humans have an innate desire for nature to be in close proximity and to seek it out for beauty, food, shelter, and even defense from enemies (Gullone, 2000; Keniger et al., 2013). The ancient nobility of Egypt, Persian settlements, medieval Chinese, and English monarchies all had elaborate gardens in their courts, and went to considerable lengths to establish and maintain them (Ulrich,

1993). This “love of life and the living world” is defined as *biophilia* (Wilson, 1984). The significance of this term has profound implications and is still being researched today into how exactly it works. Wilson (1984; 1993) proposed that the natural environment and the affiliation humans had with it shaped and helped develop human cognitive and emotional apparatus, as well as served to enhance the fitness humans exhibited (Gullone, 2000). Currently humans are witnessing the fastest rate of technological advancement in its history as a species (Gullone, 2000). At the same time though in the last few decades there has also been a rise in numerous health issues, ranging from psychological to physical ailments (Davison, & Lawson, 2006; Mitchell, & Popham, 2008; Pretty et al., 2005). Wilson (1993) stated, “…the brain evolved in a biocentric world (encompassing of environmental ethics that extend morals from human beings to all living things in nature), not a machine-regulated world” (Gullone, 2000, p. 4). With this line of reasoning it can be seen why Wilson’s theory of biophilia continues to be a prominent feature in today’s research into the relationship between humans (physically and mentally) and the natural world.

Physical Benefits of Nature

Nature has many benefits for the physical state of people through opportunities of green exercise, a place of relaxation, and more; especially in today’s time with increasing rates of cardiovascular disease, obesity, type 2 diabetes, and other health ailments (Mitchell & Popham, 2008; Pretty et al., 2006; Clements, 2004; Howell, Dopko, Passmore, & Buro, 2011; Davison & Lawson,

2006). There have been numerous studies on how to reduce the risks of being diagnosed with a stress-induced illness and reducing the severity of it through exercise and performing activities in designated “green spaces” (Pretty et al., 2005; Hales, Carroll, Fryar, & Ogden, 2017; Centers for Disease Control and Prevention, 2017). Green spaces are defined as, “open, undeveloped land with natural vegetation” (Mitchell & Popham, 2008, p. 1). Studies have shown that exercising or simply being outside in these green spaces, e.g. forests and parks, is shown to reduce stress, blood pressure, headaches, and even improve recovery rates when healing in comparison to exercise performed in urban environments or areas where there are no views of natural environments (Keniger et al. 2013; Petty et al., 2005; Ulrich, 1984). Even just being in close proximity to readily available green spaces has been shown to still have physiological benefits for people who may not be as actively exercising due to the natural reduction in stress by being exposed to green spaces (Mitchell & Popham, 2008; Ulrich, 1984).

Children are no exception to these health risks of high blood pressure, headaches, and similar health issues that can arise from stress and can be mitigated by an increase in exposure to green spaces. The United States from 2011-2014 had more than 12.7 million children (about 17% of children), from ages 2 to 19 years of age, who were considered obese (CDC, 2017). Even with the millions of cases of obesity and other such health issues in children ages 2 to 19, studies have shown that the same positive effects of green spaces on adults show similar results in children as well (Pretty et al., 2005; Ulrich, 1984;

Greenleaf, Bryant, & Pollock, 2014). One of the theories to this upward trend in health issues is due to children choosing to use technology, and becoming distracted from healthy life practices by things, such as video games, social media, and other various forms of entertainment, which they can enjoy inside (Soga & Gaston, 2016; Miller, 2005; Davison & Lawson, 2006). This has reduced the amount of time children spend outside exploring and learning about their surrounding area (Clements, 2004). A study done by Clements (2004) asked children in six different schools whether they preferred to play indoors or outdoors. The result of this 2004 study was 40% of children preferred to play indoors and 70% reported their favorite pastime as watching television. The surveys Clements conducted with parents showed that 78% of them, as children, reported regularly playing imaginary games outside; this is in comparison to their children who were reported as playing imaginary games outside at only 57%. There is considerable evidence that is showing that 35% of youth in the United States are failing to meet the minimum physical activity guideline, and another 14% are completely inactive in physical activities (Davison & Lawson, 2006). Some of this may be due to urbanization and the lack of access to recreational areas that are safe for children to go to without supervision (Wells, 2000; Wells & Evans, 2003). If children are exposed to more green spaces, such as urban parks, that are easily accessible with or without parental supervision some of the arising health issues from a lack of physical activity could be resolved (Davison & Lawson, 2006; Van den Berg & Custers, 2011).

Psychological Benefits of Nature

Humans have for a long time had an “innate tendency to focus on life and lifelike processes” Wilson (1984, p.1). What Wilson was describing was his hypothesis of *biophilia*, which indicates the human tendency or need to maintain a connection, of some level, to nature (Gullone, 2000). From here the benefits of nature on the human mind have and are still being researched to find how far and how exactly nature effects people. There has always been a connection instinctive to humans with nature as a source of reprieve from the hustle and bustle of everyday life. It has been noted in many studies that simply viewing nature, as a source of minimal exposure, can have stress relieving, attention restoration, and calming effects on people (Kaplan, 2001; Ulrich, 1984). Environmental psychology emerged as a distinctive sub-discipline during the 1970s to account for the lack of research in the field for the human-nature connection (Schroeder, 1996). Over time many psychological practices and theories came from this rise in environmental psychology. A more recent term that has been adopted by a few researchers is the umbrella term “human-nature” connection (HNC); this term encompasses a broad range of concepts from differing disciplines and applications (Ives, Giusti, Fischer, Abson, Klaniecki, Dorninger, & Raymond, 2017). The HNC can be seen in many different types of research within the scope and realm of the psychological benefits of nature. Kaplan (1973) and Van den Berg & Custers (2011) observed the psychological relief from stress seen through gardening as an activity, although Kaplan mentions that there is also the variable of mere fascination as a source of stress

relief. Even having a sense of connection through something as minimal as an indoor plant in an individual's workplace has shown to have a positive effect on the mental well-being of the individual (Bringslimark, Hartig, & Patil, 2007).

These same concepts are no different for school-aged children. Even with limited visibility of plants there is a significant positive impact on students' level of comfort and friendliness (Han, 2009). A study conducted on third graders, in a predominantly disadvantaged Midwestern school, was comparing class engagement after lessons in nature vs. matched class lessons over 10 weeks. The lessons in nature had an advantage in four of five measures of classroom engagement (Kuo, Browning, & Penner, 2017). The number of redirects, a brief interruption of the class to correct a students' behavior, were cut nearly in half after lessons in nature(Kuo, Browning, & Penner, 2017).

Outdoor education itself does not have a significant amount of research into the psychological benefits that can be attained from it. Gustafsson, Szczepanski, Nelson, & Gustafsson (2012) conducted a study in Sweden by showing a small, although statistically insignificant, benefit in mental health recovery for children of school age (Gustafsson et al., 2012; Bringslimark, Hartig, & Patil, 2007). However, it is still theorized that had the parameters, in regards to the students being from an environmentally and socially privileged area, the study may have changed (Gustafsson, Szczepanski, Nelson, & Gustafsson, 2012). As a hindsight to some issues with the methodology of the study, there would have most likely been a significant level of benefit displayed from outdoor education on the mental well-being of the children involved in the study

(Gustafsson, Szczepanski, Nelson, & Gustafsson, 2012). The value of researching further into the psychological benefits of nature through an outlet, such as outdoor education, is important for the furthering of our understanding of the HNC, especially in children.

Cognitive Benefits of Nature

Cognition is defined by Merriam Webster as "the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses." Humans use cognitive functions daily for the purposes of analyzing situations and bringing up prior experiences to evaluate what should be done, or learning and recording into our minds a new experience to later be drawn upon. It has been argued that this development of cognition in humans has evolved over time through an affiliation with nature that is primordial, known as *biophilia* (Wilson, 1984). There are numerous supportive findings following under the idea of *biophilia* that show restored cognitive functioning following some form of immersion in nature (Howell et al., 2011). It has been shown in other studies that cognitive and attentive functions are demonstrated through the ability to recall specific information based on the phrasing of a question (Berman, Jonides, & Kaplan, 2008; Wells, 2000; Keniger et al., 2013; Cheng et al. 2012). Although, the person asked may not recall every single detail he or she will be able to point out the main points and details related to the question. Adults and children have shown through several studies that being exposed to nature, even in minimal situations, can have a restorative effect on their attention and cognitive functions

and improve their ability to perform tasks (Berman, Jonides, & Kaplan, 2008). Following this same thought process research has shown that utilizing "Environmental Enrichment" treatments can assist in the cognitive functions recovery of patients with traumatic brain injuries (TBI) (Cheng et al., 2012, [p. 1]). It was shown that utilizing "Environmental Enrichment" as a form of treatment not only worked in the recovery of cognitive functions the results were long-lasting, although faded over time without follow-up treatments (Cheng et al., 2012). Students are also in need of cognitive development even through their college-aged years of academic pursuit. A study performed on college-aged students showed that after an outdoor education (OE) experience they reported an increase in their group work skills and enhanced self-efficacy (Cooley, Cumming, & Burns, 2013). In a three month post-study survey the outcomes reported were still significantly higher than the pre-study measures taken, demonstrating the long-term effects. The research has shown significant outcomes in the cognitive benefits gained from exposure to nature. A portion of this research has been focused on younger children, ages 8-15, who are still developing cognitive functions (Collado, Staats, & Corraliza, 2013; Wells, 2000; Berman, Jonides, & Kaplan, 2008). A study from England found that students who experienced an outdoor education course showed higher cognitive recall in class work, and even being able to recall sights, smells and sounds that they learned during the experience and connecting it to questions in the classroom (National Foundation for Educational Research in England and Wales, & Dillon, 2005). The cognitive benefits for children stemming through nature are not only

in learning environments, but even in things as simple as summer camps and "greenness" in their homes have shown to have significant impacts on cognitive development and attentiveness (Collado, Staats, & Corraliza, 2013; Wells, 2000). Signs of this have included: increased attention spans, due to the mental calming effects that nature has exhibited, the development of environmentally friendly behaviors and memory recall on testing material (Collado, Staats, & Corraliza, 2013; Wells, 2000; Berman, Jonides, & Kaplan, 2008).

The Importance of Nature and Outdoor Play for Children

Nature serves as a learning tool for children as they grow and develop their social, cognitive, psychological, creative mindsets and skills necessary for survival. When asked where they like to play a child's preference is typically a green or natural environment, but this is when it is available for usage (Davison, & Lawson, 2006; Wells, 2000; Wells & Evans, 2003). Having a preferred environment is an instinctual development for long-term survival and this preference even results in less stress (Wells & Evans, 2003). This notion has been studied by many researchers, although it is still thought to have limitations due to many studies utilizing qualitative self-report measures and the plausibility of the freedom of choice in playing can have a great effect on child development (Taylor, Kuo, Spencer, & Blades, 2006). With this factor in mind it only shows how vital studies conducted on outdoor play and child connections to nature are to further our understanding of the relationship between the two. More studies have shown positive outcomes when children are placed in a situation where

they have the option for outdoor unstructured play versus other forms of play (Davison & Lawson, 2006). According to the 2013 Youth Risk Behavior Survey, 33% of students reported watching television for three or more hours per day on an average school day, and 41% reported using computers, for non-school related activities, such as video games and social media, for three or more hours per day (National Association for Sport and Physical Education, 2016). When children get away from technological entertainment like this and become involved with outside play and nature-related activities they tend to develop emotional maturity and grow academically as they engage with the environment and create connections to how the world works (Clements, 2004). Along these lines of researching child development through nature based outdoor play organizations, such as the Association of Teachers and Lecturers and the Benesse Educational Research Center in Tokyo, have been showing how outdoor play helps in developing motor skills, social skills and other needed developments during pre-adolescent and adolescent age group periods (Clements, 2004). On average, according to the U.S. Department of the Interior, in 2012, American children spent 30 minutes a week on unstructured time outdoors, this in comparison to 52 hours/week on electronic media exposure (Greenleaf, Bryant, & Pollock, 2014). Anecdotally those individuals who grew up in more rural or of older generations who spent time playing outdoors before the technological boom of the last decade have known this to be true. Anecdotes are not enough though, further research into the benefits that children gain from playing outside in nature is

needed to gain a deeper understanding of how these benefits work and develop (McFarland, Zajicek, & Waliiczek, 2014; Clements, 2004).

Curriculum

Education has been the method of transporting knowledge and lessons learned from one person to another since the beginning of storytelling (Gullone, 2000; O'Brien, 2009) Education evolved into a more formal format in which the rich and powerful, or those who could afford it, throughout history would hire someone who was well-versed in many areas to teach themselves or their children so that they could succeed in life (Gullone, 2000). Even to this day, with the development of public education, *curriculum* is changing and adjusting to the times to meet the needs of the present and future. *Curriculum* is defined by Merriam-Webster as "the courses offered by an educational institution." Many countries around the world have begun including in their educational curriculum a non-traditional way of learning being addressed as outdoor education. This has given rise to "Forest Schools" which are defined as an inspirational program that offers children, young people and adults regular opportunities to achieve and develop confidence and self-esteem through hands on learning experiences in a woodland environment (O'Brien, 2009). The rise of outdoor education as a part of curriculum is from the concern that children are not having as much contact with woodlands and green spaces, whether of their own volition or the unavailability of it (O'Brien, 2009; Davison, & Lawson, 2006; Wells, & Evans, 2003). A Canadian study found that, on average, children in Canada spend less than 10 hours per

week participating in outdoor experiences, compared to 20-30 hours per week indoors engaged in non-vigorous activity (Dietze, & Crossley, 2000; Clements, 2004). With the reduction of time spent engaged in outdoor play and having outdoor experiences the approach of “Forest Schools” is becoming a great way to substitute this with the wide-range of educational resources located in woodlands and green spaces (O’Brien, 2009). Evidence of the way outdoor education in curriculum is beneficial was shown by Rios & Brewer (2014), through teacher observations, showing an impact upon the students through improvements in their science knowledge from lessons performed outside. They claimed that with being outside the students were able to connect what was discussed with a physical manifestation, and were able to interpret it in their own creative ways building a deeper understanding and connection (Rios, & Brewer, 2014). Outdoor lessons being included into the curriculum helps with behavior management, as shown in a study performed in Vermont public schools whose teachers noted less “redirects” when outside in comparison to being inside while teaching upon the same subject matter (Silverman, & Corneau, 2017). A similar study was conducted with students in Colorado and yielded mostly identical results (James, & Williams, 2017). One goal of such programs being installed into the curriculum of education systems is the intention of developing sustainability-literate citizens, as society faces more and more issues with climate change, pollution, and other environmental issues (Lugg, 2007). Ultimately the development of these outdoor education programs into curriculum falls into the hands of the local school system to develop (Brookes, 2002). The

implementation of outdoor education programs and “Forest Schools”, which have shown positive benefits for children so far, could become the new status quo.

JUSTIFICATION

The study of benefits nature has for people is still relatively new; although research has yielded many theories on how the two are related (O'Brien, 2009; Pretty et al., 2005; Keniger et al., 2013; Kaplan & Kaplan, 1989). Some of these results have been improvements to health, mental well-being, cognitive functions, and academics. These benefits have been consistent across these studies with little variation in the results (Pretty et al., 2005; Keniger et al., 2013; Kaplan, 2001; James & Williams, 2017). With the surfacing of these theories and results it should only lead to further questioning of how nature and outdoor education benefit humans, and the applications it can have for society.

The aim of this study is to help further solidify these previous findings and to show if there is a relationship between outdoor education and student academic performance and behavior in public schools. The monitoring of how students in an outdoor education class perform and comparing them to how students enrolled in a technologies class perform, in academics and behavior, will add much needed research to the existing literature of this field.

METHODS

This research utilized a sequential explanatory mixed methods approach. The sequential explanatory framework is defined by Creswell (2003) as a collection and analysis of quantitative data followed by a collection and analysis of qualitative data to assist in explaining and interpreting what the findings of the study mean. The quantitative research method used was experimental, i.e. pre, during, and post measures (Creswell, 2003). The goal of the quantitative data collection was to observe if there was a numerical trend in grades and level of nature connectedness throughout the course of the study period. The statistical analyses were conducted on the numerical data in order to check for statistically significant differences between participation in outdoor education and students' academic performance and level of nature connectedness. The qualitative data were used to highlight or explain quantitative data results when possible. It described any archetypes, or trends, in positive or negative behavior in relation to students' enrollment in either the outdoor education (test group) course or technology/keyboarding (control group) course. This study followed Stephen F. Austin State University Institutional Review Board (IRB) for the Protection of Human Subjects in Research procedure for ethical experiments and was approved on September 11, 2018 (study # AY2019-1001).

Study sites

The study sites for this project were two middle schools, McMichael Middle School and Mike Moses Middle School, both located in Nacogdoches, Texas. The demographics for Nacogdoches, TX from the latest American Community Survey (ACS) were: White 59.4%, African American 18.5%, Hispanic 19.5%, American Indian 0.9%, and Asian 1.5% (U.S. Census Bureau, 2017). The Data Access and Dissemination Systems [DADS] showed the median age, as of 2017, was 31.0 years of age (U.S. Census Bureau, 2017). The median household income, in 2016 dollars, was $38,915 with a home ownership rate of 56.5%, for the period of 2012-2016. Approximately 25.4% of Nacogdoches County residents lived at or below the poverty level for the period of 2012-2016 (U.S. Census Bureau, 2017). The education level for Nacogdoches County adult residents was 19.2% with no high school diplomas, 49.3% with high school diplomas, 5.9% with an A.A. degree, 16.4% with a Bachelor's degree, and 9.2% with a graduate or professional degree (U.S. Census Bureau, 2017).

MCMICHAEL MIDDLE SCHOOL

McMichael Middle School is located on the southeast area of Nacogdoches, TX (Appendix L). The student population was 754 students, as counted during the 2016-2017 school year (Texas Education Agency [TEA] Report Card, 2018), with racial/ethnic demographics of African American 30.6%, Hispanic 48.8%, White 18.7%, Asian 1.1%, and two or more races 0.8% (TEA, 2018). The percentage of economically disadvantaged students was 82.4% of the student

body, and 24.4% of the student body were classified as English language learners (TEA, 2018). McMichael Middle School includes grades sixth, seventh, and eighth in one main campus building. Additional resources McMichael Middle School had onsite were a football field with stands and track surrounding that was maintained. There was also a rough field used for athletic practices and outdoor education lessons.

MIKE MOSES MIDDLE SCHOOL

Mike Moses Middle School is located on the East side of Nacogdoches, TX (Appendix L). The student population was 651 students, as counted during the 2016-2017 TEA Report Card, including racial/ethnic distributions of African American 25.8%, Hispanic 45.5%, White 23.2%, American Indian 0.5%, and two or more races 2.6% (TEA, 2018). The percentage of economically disadvantaged students was 79.6% of the student body, and 28.6% of the student body were classified as English language learners (TEA, 2018). Mike Moses Middle School includes grades sixth, seventh, and eighth in one main campus building. Additional resources Mike Moses Middle School had onsite were a football field for athletic practices without stands as well as a small patch of forest with trails built into it utilized by the outdoor education class for lessons.

Methodology

To protect student confidentiality, all identifying information was masked and random numbers were assigned to each student. Parental consent forms were sent home with students at the beginning of the study period (September 11th, 2018) to ensure parents understood the importance of the research and to consent for their child to participate (Appendix A). For parents whose native language was not English a translated version was available for them. A Spanish translation of the parental consent form was attached to all packets (Appendix B). There were also assent forms for the students to complete (Appendix C). The original target was to have 35 test group students and 35 control group students in each grade level (or at least a representative number for the population) at each campus for comparison. However, due to the low return rate of consent forms the sampling was switched to a convenience sample instead from the population of students who returned signed parental consent forms and student assent forms.

At both schools the outdoor education class followed Texas Education and Knowledge Standards (TEKS), which are the Texas Education Boards requirements for class accreditation. Both schools used a 45 minute period for elective courses. Both schools' outdoor education classes had slight differences in schedules for planned activities for the semester. The technology/keyboarding classes at both middle schools followed the same curriculum as set by TEKS and followed similar schedules for planned lessons, activities, and projects.

GRADE AND BEHAVIOR DATA COLLECTION

The classes operated without any changes to their regular curriculums during the research period. Grades were collected at both middle schools with the assistance of the teachers in charge of both the outdoor education group and the technology/keyboarding group. De-identified data was used in order to minimize the invasiveness of the study. Monitoring of grades and behavior with researchers present in a classroom could have potentially caused distress or privacy invasion for some students. The researchers visited periodically to conduct survey administration and to engage the classes in an 'open-forum interview' (Figure 1). The visits also served to assess how the students behaved in the course and recorded in a journal for potential trends and themes observed, such as behavior norms, attitudes, and attentiveness to course material exhibited by the students during the study.

INSTRUMENTATION

The surveys were designed so that they were not time-consuming or overly complex for the students utilizing the Microsoft Word™ reading level feature. The survey was written at a fifth-grade reading level. This study consisted of two sets of data collected: qualitative data (open-ended survey questions and an open-forum interview) and quantitative data (scaled surveys, behavioral assessments, and academic grading). The open-ended questions were designed to allow free expression of the participants' thoughts and opinions in regards to the question. The open-forum interview consisted of nine questions designed to engage the

participants in conversation. Each open-forum interview conducted lasted approximately five minutes, and was held at the end of the class period to avoid conflict with the lesson. Topics included how students were enjoying the course, prior outdoor experiences they have had, and when was the last time they went somewhere natural (Appendix H). The only instrument that was validated prior to this study was the connection to nature measure, which was designed by Cheng and Monroe (2012). The only modification made to it was the addition of 5 open-ended questions to help deepen the researcher's understanding of what affected the level of nature connectedness exhibited by the students. The behavioral assessment was comprised of two parts a student self-evaluation and a class behavior evaluation (Appendices I & J). These worked in conjunction to see if the teacher reported behavior and the students reported behavior matched. Both parts were designed to take into account how the student or teacher were feeling that day/period since illness could be a cause of poor attentiveness or behavior.

Schedule of Survey Administrations and Data Collection for Fall 2018 at McMichael and Mike Moses Middle Schools					
	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Week 1	*10-Sep*	*11-Sep* Conest Forms administered	*12-Sep*	*13-Sep* Parental Consent Forms	*14-Sep* Parental Consent Forms
Week 2	*17-Sep* Pre-Study Survey	*18-Sep*	*19-Sep* Pre-Study Survey	*20-Sep* C to N Survey	*21-Sep* C to N Survey
Week 3	*24-Sep*	*25-Sep*	*26-Sep*	*27-Sep* Student Self-eval and Teacher Eval	*28-Sep* Student Self-eval and Teacher Eval
Week 4	*1-Oct*	*2-Oct*	*3-Oct*	*4-Oct*	*5-Oct*
Week 5	*8-Oct*	*9-Oct*	*10-Oct*	*11-Oct*	*12-Oct*
Week 6	*15-Oct* Holiday	*16-Oct* Parental Surveys sent out	*17-Oct* Parental Surveys sent out	*18-Oct* Group Discussion	*19-Oct* Group Discussion
Week 7	*22-Oct*	*23-Oct*	*24-Oct*	*25-Oct* C to N Survey #2	*26-Oct* C to N Survey #2
Week 8	*29-Oct*	*30-Oct*	*31-Oct*	*1-Nov* Student Self-eval and Teacher Eval #2	*2-Nov* Student Self-eval and Teacher Eval #2
Week 9	*5-Nov*	*6-Nov*	*7-Nov*	*8-Nov*	*9-Nov*
Week 10	*12-Nov*	*13-Nov*	*14-Nov*	*15-Nov*	*16-Nov* Holiday
Week 11	*19-Nov* Holiday	*20-Nov* Holiday	*21-Nov* Holiday	*22-Nov* Holiday	*23-Nov* Holiday
Week 12	*26-Nov*	*27-Nov*	*28-Nov*	*29-Nov*	*30-Nov*
Week 13	*3-Dec*	*4-Dec*	*5-Dec*	*6-Dec*	*7-Dec*
Week 14	*10-Dec*	*11-Dec* C to N Survey #3	*12-Dec* C to N Survey #3	*13-Dec* Post-Study Survey	*14-Dec* Post-Study survey
Week 15	*17-Dec*	*18-Dec*	*19-Dec*	*20-Dec*	*21-Dec*

Figure 1. Administration schedule for surveys and evaluations from McMichael Middle School and Mike Moses Middle School. Orange represents Mike Moses, green represents McMichael, red represents holidays and gray represents days both schools were visited, 2018.

QUANTITATIVE DATA

The quantitative data were collected in three ways. First, the researcher collected all three six-week grade sets and the semester grade averages at the end of the study period for each individual student. The grades were then compared by group and their campus. The grades were also used to compare the groups between the two campuses to look for consistency. The data were compared as aggregate data and kept the students de-identified; however, if

there were specific cases of improvement that were remarkable the student number identifier was used to show the individual student as an example. A secondary comparison was also done to compare academic grades by gender and race/ethnicity to see if there was a relationship between gender or race/ethnicity and academic performance. This was to define trends specific to any demographic that may be statistically significant. The second way data were collected was the behavior monitor system, which was slightly different between the two campuses. Although both schools follow the CHAMPS system for classroom management (Sprick, 2016), they track behavior differently. The third way data were collected was a connection to nature measure (Cheng and Monroe, 2012). This data was entered into SPSS and was used to evaluate if from the start of the study to the end of the study there was a change in the students' individual levels of nature connectedness (Appendix K).

QUALITATIVE DATA

The qualitative data were collected using multiple surveys that were given throughout the period of study and a mid-study open-forum interview (Appendix E). The pre- and post-study (open-ended) surveys were administered at the start of the study period (September 17th and 19th), after all of the consent forms had were collected and the convenience sample pool created. The post-study survey was administered at the end of the study period (December 13th and 14th) before the semester ended (Appendices F & G). These served to note any significant change in thoughts and attitudes towards nature and outdoor education from the

beginning of the study to the end of the study. A parental opinion survey was sent out by the teachers to see how parents viewed nature and outdoor education, as well as the amount of time their child spends immersed in outside activities of any kind (Appendix D). Additional surveys were administered at predetermined dates that were spaced apart as to not disrupt the flow of the school year. The surveys consisted of a teacher class behavior assessment survey and student behavior self-assessment (Appendices I & J). Each survey tracked and observed how the thoughts and attitudes of the students changed, if they changed, from the start to the end of the study. Although all students filled out the surveys, only the sample pool students' surveys were used for data analysis. This was done to protect the students who were in the sample pool so that the students could not be singled out by others. The non-participants data were stored in sealed envelopes and locked inside a file cabinet. The open-forum interview was conducted with all students present at the end of week six of the study (Appendix H). The open-forum interview was recorded with an audio recorder, and was transcribed for analysis. All surveys and questions were written on a fifth grade reading level to ensure they were easy to understand. This was done by utilizing the Microsoft Word reading level feature.

CLASS DOJO

McMichael Middle School (Appendix L) had recently implemented a new system of behavior monitoring through the "Class Dojo" app. The Class Dojo app was set up to have a profile for each class and each student in the class.

Following the training in the “CHAMPS” system the teachers came together for each grade level or “team” and selected the behaviors, good and bad, and assigned point values to the behaviors for what they felt was appropriate as a reward for good behavior or a consequence of bad behavior. To keep students de-identified the teachers involved only pulled the data for the participants and then labeled their data with their randomly generated number identifier leaving only the demographics of the participant, i.e. gender and race/ethnicity. A statistical analysis was conducted using IBM™ Statistical Package for the Social Sciences version 25 (SPSS ver. 25) to determine if the different variables had statistically significant differences when comparing the outdoor education and technology/keyboarding groups for behavior.

Return Rate

The total number of consent forms that were distributed between both Mike Moses and McMichael Middle Schools for this study was a total of 455. Mike Moses was distributed 227 consent forms and McMichael was distributed 228 consent forms. The total number of consent forms that were returned along with the student consent forms was 89 between both schools, which was a 19.56% return rate. Mike Moses had 63 consent forms with student assent forms returned, which was a 27.75% return rate. McMichael had 26 consent forms with student assent forms returned, which was an 11.40% return rate. Baruch & Holtom (2008) literature review of survey-based studies from 2000 to 2005 showed an average aggregate response rate of 50%.

Reliability Analysis and Statistical Analysis

A reliability analysis using Cronbach's alpha in SPSS was used to determine if the connection to nature measure (Cheng & Monroe, 2012) was reliable for the study. The original reliability measure that Cheng and Monroe (2012) calculated for their connection to nature measure was $\alpha = 0.87$. Cronbach's alpha was calculated for the whole population to determine if the connection to nature measure (Cheng & Monroe, 2012) was reliable to use for analysis. A minimum reliability threshold of $\alpha = 0.75$ was used to conform too closely to the original connection to nature measure. The Cronbach's alpha analysis yielded: CN measure Sept. 20-21 $\alpha = 0.88$, Oct. 25-26 $\alpha = 0.85$, Dec. 11-12 $\alpha = 0.88$ for the three connection to nature measures administered. Thus, the connection to nature measure (Cheng & Monroe, 2012) was reliable for the study.

The statistical procedures that were used to analyze the data from this study were the t-test and Two-Way ANOVA procedures (Szafran, 2011). The t-test procedure was used to test if there was any statistical significance in the group being compared on connection to nature scores and grades. The two-way ANOVA procedure was used to investigate if there were any compounding effects from the interactions of the independent variables on the connection to nature scores and grades. For the p-value to be statistically significant in these analyses, it will follow the standard p-value ≤ 0.05.The other three sets of data were used to see if there was a trend during the duration of the study. If there

were values that were statistically significant during the study, but the overall average was not statistically significant this was covered in Chapter 5 of this thesis.

LIMITATIONS AND BIASES

A few limitations were identified with this study that the researcher was not able to address due to the applied nature of this study. Students may have been influenced by any current or previous involvement with outside recreational organizations or activities, such as Scouting, sport clubs, Future Farmers of America (FFA), and 4-H. These could not be controlled due to it being outside of the school setting and could have affected the study by already having developed positive or negative views of nature and outdoor education through those experiences. To address this influence there were questions within the surveys that asked the students to self-report if they had been involved in organizations or outdoor activities. This did not remove them from the convenience sample pool, but was accounted for if there were statistically significant results at the end of the study. Existing behavioral or emotional disabilities could have been a limitation of the study as well as learning disabilities. Any existing behavioral issues could have influenced negative or positive behavior traits exhibited. This information was not addressed in this study to maintain privacy of the students. The main limitation of this study was the length of the study. With the study duration only being 15 weeks the researcher may not have gathered enough data over a period of time to show significant change in the students. By keeping the design of the study simple and straightforward, the researcher hoped to create a model for future studies.

Other Considerations

Other considerations that could have had an impact on the results of this study were hunting season being mid-way through the study and the weather throughout the course of the study. These factors may have had effects on the results of the connection to nature measure scores through increases or decreases in scores depending on the factor.

Hunting season began for White-tailed Deer, Rio Grande Turkey, Snipe, Squirrel, and more in late October after the 27th. This could show an increase in the connection to nature scores of those who hunt, due to having more exposure to nature. In turn effecting the scores on the second and third connection to nature measures.

Weather plays a significant role in what the outdoor education class is able to do. If the weather were potentially poor the outdoor education class might have to stay inside until the weather passes, for safety reasons. With the unpredictability of weather in regards to this study if a poor weather day is during one of the administration days the results could be skewed.

RESULTS

The data analyzed for this research were collected over the course of 15 weeks at both Mike Moses Middle School and McMichael Middle School during Fall 2018. The data are discussed as quantitative data and qualitative data. Analysis for quantitative data utilized IBM™ SPSS version 25. All data analyzed used an alpha of 0.05 for determining statistical significance. Qualitative data followed a basic coding scheme created by the researcher on common archetypes present in the data.

Demographics

The difference between the demographics of students in the study sample in each group (whole, Mike Moses only, and McMichael only) compared to the Nacogdoches Independent School District (NISD) demographics are relatively similar. The racial/ethnic demographics of the participants of this study for the whole sample were White 35.96%, African American 19.10%, Hispanic 35.96%, and Other 7.87%. The NISD demographics were White 59.4%, African American 18.5%, Hispanic 19.5%, and Other 2.4%, where other here consists of all members of American Indian, Asian, and 2 or more races (TEA, 2018). Other was grouped as such to protect the identities of participants whose races/ethnicities might be easily identified. The demographics for the Mike Moses only sample was White 41.27%, African American 12.70%, Hispanic 39.68%, and Other 6.35%. The Mike Moses Middle School demographics were White

23.2%, African American 25.8%, Hispanic 45.5%, and Other 3.1% The demographics for the McMichael only sample was White 23.08%, African American 34.62%, Hispanic 30.77%, and Other 11.54%. The McMichael Middle School demographics were White 18.7%, African American 30.6%, Hispanic 48.8%, and Other 1.9%. The participants in each sample's demographics varied slightly over or under, depending on the race/ethnicity, compared to the NISD demographics. However, the demographics of the sample groups were close enough to show a mostly accurate representation of the population's demographics at both schools.

GROUP AND CONNECTION TO NATURE

The numbers of participants (n) for both groups varied for each test due to non-response errors in the datasets. The whole sample comparison of groups (n = 89) was analyzed using the independent sample t-test procedure to determine if the Outdoor Education group (n = 61) had a higher connection to nature, on average, than the Technology/Keyboarding group (n = 28). The mean difference between the Outdoor Education group and Technology/Keyboarding group average connection to nature score was 0.03 points (Table 1). The means over time were variable without any significant mean differences. The mean differences respectively were: M = 0.13, 0.14, and 0.16. The null hypothesis is true is larger than $\alpha = 0.05$, the null hypothesis was not rejected. Therefore, based upon this it cannot be said that students in outdoor education have in this

sample a higher connection to nature score, on average, than the technology/keyboarding students.

Table 1. Connection to Nature measure whole population comparison of groups.

	Outdoor Education		Technology/Keyboarding				
Date of Measure	Mean (M)	n	Mean (M)	n	t	df	p value
Sept. 20-21	3.78	61	3.65	25	0.771	32.923	0.223
Oct. 25-26	3.87	58	3.73	26	1.050	52.434	0.150
Dec. 11-12	3.69	54	3.84	26	-1.101	48.567	0.138
Average Score	3.77	51	3.74	23	0.174	39.439	0.432

Footnote: * indicates statistical significance

The Mike Moses only comparison (n = 63) was analyzed using the t-test (Table 2) procedure to determine if the Outdoor Education group (n = 42) had a higher connection to nature, on average, than the Technology/Keyboarding group (n = 21). The mean difference between the Outdoor Education group and Technology/Keyboarding group was 0.05 points. The mean differences respectively were: M = 0.05, 0.19, and 0.24. The null hypothesis was not rejected. Therefore, it cannot be said that the Mike Moses sample students in outdoor education have a higher connection to nature score, on average, than the technology/keyboarding students.

The McMichael only comparison (n = 26) was analyzed using the independent sample t-test (Table 3) procedure to determine if the Outdoor Education group (n = 19) had a higher connection to nature, on average, than the Technology/Keyboarding group (n = 7).

Table 2. Connection to Nature measure data comparison for the Mike Moses only groups.

	Outdoor Education		Technology/Keyboarding				
Date of Measure	Mean (M)	n	Mean (M)	n	t	df	p value
Sept. 20	3.79	42	3.83	18	-0.300	27.753	0.384
Oct. 25	3.95	40	3.76	20	1.207	34.775	0.118
Dec. 11	3.73	37	3.98	20	-1.756	53.459	0.043*
Average Score	3.81	35	3.86	18	-0.356	39.443	0.362

Footnote: * indicates statistical significance

The mean difference between the Outdoor Education group and Technology/Keyboarding group overall was 0.25 points. The mean differences respectively were: M = 0.58, 0.06, and 0.19. The null hypothesis was not rejected. Therefore, it cannot be said that the McMichael sample students in outdoor education have a higher connection to nature score, on average, than the technology/keyboarding students.

Table 3. Connection to Nature measure data comparison for the McMichael only groups.

	Outdoor Education		Technology/Keyboarding				
Date of Measure	Mean (M)	n	Mean (M)	n	t	df	p value
Sept. 21	3.76	19	3.19	7	1.416	7.401	0.099
Oct. 26	3.70	18	3.64	6	0.254	15.840	0.401
Dec. 12	3.59	17	3.40	6	0.476	5.863	0.326
Average Score	3.67	16	3.42	6	0.703	6.584	0.253

Footnote: * indicates statistical significance

GENDER AND CONNECTION TO NATURE

The numbers of participants (n) for both gender groups varied for each test due to non-response errors in the datasets. The whole group comparison (n = 89) was analyzed using the independent sample t-test procedure to analyze if there is a difference in connection to nature between male students (n = 45) and female students (n = 44) (Table 4). The mean difference between the male students and female students was 0.42 points and was statistically significant. The means throughout the study were variable with every testing period having statistically significant mean differences (M = 0.36, 0.30, 0.46).

Table 4. Connection to Nature measure whole population comparison of genders.

	Male		Female				
Date of Measure	Mean (M)	n	Mean (M)	n	t	df	p value
Sept. 20-21	3.56	42	3.92	44	-2.918	74.841	0.005*
Oct. 25-26	3.68	43	3.98	41	-2.463	81.207	0.016*
Dec. 11-12	3.51	40	3.97	40	-3.796	70.556	0.000*
Average Score	3.55	36	3.96	38	-3.836	66.447	0.000*

Footnote: * indicates statistical significance

The null hypothesis was rejected showing there is a significant difference between male and female students' connection to nature scores, in this sample. Female students were significantly higher than male students for all three tests and the overall score.

The Mike Moses only comparison (n = 63) was analyzed using the t-test procedure to determine if there is a difference in connection to nature between

male students (n = 30) and female students (n = 33) (Table 5).

Table 5. Connection to Nature measure Mike Moses comparison of genders.

	Male		Female				
Date of Measure	Mean (M)	n	Mean (M)	n	t	df	p value
Sept. 20	3.61	27	3.96	33	-2.906	56.747	0.005*
Oct. 25	3.77	29	4.00	31	-1.620	57.988	0.111
Dec. 11	3.55	26	4.04	31	-3.464	44.503	0.001*
Average Score	3.60	23	4.01	29	-3.560	48.389	0.001*

Footnote: * indicates statistical significance

The overall mean difference between the male students and female students was 0.41 points and was statistically significant (p = .001). The means throughout the study were variable with two of the three test periods (Sept. 20 and Dec. 11) having statistically significant mean differences (M = 0.36, 0.23, 0.50). The null hypothesis was rejected showing there is a difference between male and female student's connection to nature scores. Female students were significantly higher than male students for two of the three tests and the overall score, and the test that was not significantly higher the female students still had a higher connection to nature score on average.

The McMichael only comparison (n = 26) was analyzed using the t-test procedure to determine if there is a difference in connection to nature between male students (n = 15) and female students (n = 11) (Table 6). The overall mean difference between the male students and female students was 0.37 points and was not statistically significant, although female students still had a larger connection to nature score on average.

Table 6. Connection to Nature measure McMichael comparison of genders.

	Male		Female				
Date of Measure	Mean (M)	n	Mean (M)	n	t	df	p value
Sept. 21	3.48	15	3.78	11	-1.152	20.739	0.262
Oct. 26	3.50	14	3.95	10	-1.953	20.178	0.065
Dec. 12	3.43	14	3.71	9	-1.261	20.927	0.221
Average Score	3.45	13	3.82	9	-1.664	18.286	0.113

Footnote: * indicates statistical significance

The overall mean difference between the male students and female students was 0.37 points and was not statistically significant, although female students still had a larger connection to nature score on average. The mean differences for the testing periods respectively were: M = 0.31, 0.45, and 0.28. The null hypothesis was not rejected. Female students were still higher, on average, than male students for all three tests and the overall score, although none of the tests were statistically significant.

RACE/ETHNICITY AND CONNECTION TO NATURE

The numbers of participants (n) for both groups varied for each test due to non-response errors in the datasets. The whole group comparison (n = 89) was analyzed using the independent sample t-test procedure to analyze if there is a difference in the connection to nature between the races/ethnicities in the sample. The t-test was coded as students of color (n = 57) compared to white students (n = 32). This was done to protect the identity of students who

participated in this study (Table 7). Students of color had a higher mean (M = 3.79) compared to white students (M = 3.71). However, the mean difference (mean difference = 0.07) was not significant (t = -0.566, df = 46.010, p = 0.574). The mean differences respectively were: M = 0.10, 0.06, and 0.30. The null hypothesis was not rejected. Overall, two of three tests and the average score showed that there is not a difference in the connection to nature scores between students of color and white students.

Table 7. Connection to Nature measure whole sample comparison of students of color and white students.

	Students of Color		White Students				
Date of Measure	Mean (M)	n	Mean (M)	n	t	df	p value
Sept. 20-21	3.71	55	3.81	31	0.891	82.930	0.376
Oct. 25-26	3.81	54	3.87	30	0.467	76.547	0.642
Dec. 11-12	3.63	51	3.93	29	2.503	74.955	0.014*
Average Score	3.79	48	3.71	26	-0.566	46.010	0.574

Footnote: * indicates statistical significance

The Mike Moses only comparison (n = 63) was analyzed using the t-test procedure to analyze if there is a difference in the connection to nature between the races/ethnicities in the sample. The t-test (Table 8) was coded as white students (n = 26) compared to students of color (n = 37). The average score from the study is what determined if the analysis did or did not yield a statistically significant finding. Students of color had a higher mean (M = 3.85) compared to white students (M = 3.79). However, the mean difference (mean difference = 0.06) was not significant (t = -0.512, df = 49.087, p = 0.611). The mean

differences respectively were: M = 0.02, 0.04, and 0.21. The null hypothesis was not rejected. Overall, there is not a difference in the connection to nature scores between students of color and white students in the Mike Moses sample.

Table 8. Connection to Nature measure Mike Moses comparison of students of color and white students.

	Students of Color		White Students				
Date of Measure	Mean (M)	n	Mean (M)	n	t	df	p value
Sept. 20	3.78	35	3.80	25	0.024	56.975	0.981
Oct. 25	3.90	35	3.86	25	-0.309	57.702	0.758
Dec. 11	3.73	33	3.94	24	1.437	54.998	0.156
Average Score	3.85	31	3.79	21	-0.512	49.087	0.611

Footnote: * indicates statistical significance

The McMichael only comparison (n = 26) was analyzed using the t-test procedure to analyze if there is a difference in the connection to nature between the races/ethnicities in the population. The t-test (Table 9) was coded as students of color (n = 20) compared to white students (n = 6). Students of color had a higher mean (M = 3.66) compared to white students (M = 3.39). However, the mean difference (mean difference = 0.28) was not significant (t = -0.601, df = 4.4616, p = 0.577). The mean differences respectively were: M = 0.30, 0.26, and 0.45. Since the probability of getting the sample results if the null hypothesis is true was larger than $\alpha = 0.05$ the null hypothesis was not rejected. Overall, there is not a difference in the connection to nature scores between students of color and white students in the McMichael sample.

Table 9. Connection to Nature measure McMichael comparison of students of color and white students.

	Students of Color		White Students				
Date of Measure	Mean (M)	n	Mean (M)	n	t	df	p value
Sept. 21	3.54	20	3.83	6	1.324	22.255	0.199
Oct. 26	3.63	19	3.89	5	0.973	8.721	0.357
Dec. 12	3.44	18	3.89	5	2.115	11.753	0.057
Average Score	3.66	17	3.39	5	-0.601	4.4616	0.577

Footnote: * indicates statistical significance

Relationships between groups and academic performance

The academic grades collected on the participants of this study were analyzed using the t-test procedure. The grades were broken into different sample groups for comparison to note any statistical significance. The data used for the analysis was 1st six weeks grades, 2nd six weeks grades, 3rd six weeks grades, semester average grades, semester grades by gender, and semester race/ethnicity grades. The sample groups were: whole group, Mike Moses only, and McMichael only. The numbers of participants (n) for the groups varied for each test due to non-response errors in the datasets.

TOTAL SAMPLE RELATIONSHIP TO ACADEMIC PERFORMANCE

The whole sample comparison of groups (n = 88) was analyzed using the t-test procedure to determine if the Outdoor Education group (n = 61) had a higher grades in the 1st six weeks, on average, than the Technology/Keyboarding group

(n = 28). Of the 5 subjects, that had an independent sample t-test performed, only the elective has a statistically significant mean difference in grades (Table 10).

Table 10. t-test for whole sample 1st six weeks grades comparison by group.

	Outdoor Education		Technology/Keyboarding				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	99.72	60	95.30	27	7.773	85.000	0.000*
Math	84.12	60	83.04	28	0.535	57.322	0.298
English	88.32	60	88.29	28	0.017	47.419	0.494
History	90.48	60	88.89	28	0.838	46.819	0.203
Science	91.75	60	92.54	28	-0.570	62.859	0.286

Footnote: * indicates statistical significance

The mean differences between each course were Elective mean difference = 4.42, Math mean difference = 1.08, English mean difference = 0.28, History mean difference = 1.59 and the Science mean difference = 0.79. The null hypothesis is not rejected for all of the subjects, with the exception of the elective course. Overall, the grades for both the outdoor education group and technology/keyboarding group were very close showing that there is not a difference in the academic performance, with the exception of the elective class.

The t-test analysis for the whole (n = 88) comparison of if the Outdoor Education group having higher 2nd six weeks grades, on average, than the technology/keyboarding group (n= 28). Of the 5 subjects, that had an independent sample t-test performed, only the elective has a statistically significant mean difference in grades (Table 11).The mean differences between each course were Elective mean difference = 2.82, Math mean difference = 0.77,

English mean difference = 0.01, History mean difference = 0.63 and the Science mean difference = 0.45.

Table 11. t-test for whole sample 2nd six weeks grades comparison by group.

	Outdoor Education		Technology/Keyboarding				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	98.63	60	95.81	27	2.242	39.035	0.016*
Math	86.38	60	87.15	27	-0.429	61.339	0.335
English	87.88	60	87.89	28	-0.005	44.535	0.498
History	87.23	60	87.86	28	-0.323	61.939	0.374
Science	91.40	60	91.85	27	-0.265	51.924	0.396

Footnote: * indicates statistical significance

The null hypothesis is not rejected for all of the subjects, with the exception of the elective course. Overall, the grades for both the outdoor education group and technology/keyboarding group were very close showing that there is not a difference in the academic performance, with the exception of the elective class.

The whole comparison of groups (n = 88) was analyzed using the t-test procedure to determine if the Outdoor Education group (n = 61) had a higher grades in the 3rd six weeks, on average, than the technology/keyboarding group (n = 28). Of the 5 subjects, that had an independent sample t-test performed, only the elective has a statistically significant mean difference in grades (Table 12).The mean differences between each course were Elective mean difference = 1.60, Math mean difference = 1.14, English mean difference = 0.50, History mean difference = 0.55 and the Science mean difference = 1.21. The null hypothesis is not rejected for all of the subjects, with the exception of the elective course. Overall, the grades for both the outdoor education group and

technology/keyboarding group were very close showing that there is not a difference in the academic performance, with the exception of the elective class.

Table 12. t-test for whole sample 3rd six weeks grades comparison by group.

	Outdoor Education		Technology/Keyboarding				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	99.20	59	97.61	28	2.038	85.000	0.023*
Math	84.90	59	86.04	28	-0.568	57.561	0.286
English	87.29	59	87.79	28	-0.282	53.608	0.340
History	88.41	59	88.96	28	-0.290	57.923	0.387
Science	90.22	59	91.43	28	-0.870	69.937	0.194

Footnote: * indicates statistical significance

The whole comparison of groups (n = 88) was analyzed using the t-test procedure to determine if the Outdoor Education group (n = 61) had a higher semester grades, on average, than the Technology/Keyboarding group (n = 28). Of the 5 subjects, that had an independent sample t-test performed, only the elective has a statistically significant mean difference in grades (Table 13).

Table 13. t-test for whole sample semester grades comparison by group.

	Outdoor Education		Technology/Keyboarding				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	99.20	60	96.11	28	4.689	86.000	0.000*
Math	85.15	60	85.21	28	-0.036	56.708	0.486
English	87.83	60	88.00	28	-0.099	46.528	0.461
History	88.73	60	88.54	28	0.117	57.793	0.454
Science	91.15	60	91.89	28	-0.566	62.617	0.287

Footnote: * indicates statistical significance

The mean differences between each course were Elective mean difference = 3.09, Math mean difference = 0.06, English mean difference = 0.17, History

mean difference = 0.19 and the Science mean difference = 0.74. The null hypothesis is not rejected for all of the subjects, with the exception of the elective course. Overall, the grades for both the outdoor education group and technology/keyboarding group were very close showing that there is not a difference in the academic performance, with the exception of the elective class.

The whole (n = 88) comparison of genders was analyzed using the t-test procedure to determine analyze if there is a difference in semester grades (Table 14) between male students (n = 44) and female students (n = 44). The mean differences between each course were Elective mean difference = 0.79, Math mean difference = 0.02, English mean difference = 0.63, History mean difference = 0.48 and the Science mean difference = 1.45. The null hypothesis is not rejected. Overall the male and female students did not have a statistically significant difference in any subject.

Table 14. t-test for whole sample semester grades comparison by gender.

	Male		Female				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	97.82	44	98.61	44	-1.164	85.190	0.248
Math	85.16	44	85.18	44	-0.013	84.791	0.989
English	87.57	44	88.20	44	-0.427	84.670	0.671
History	88.43	44	88.91	44	-0.294	85.996	0.769
Science	90.66	44	92.11	44	-1.119	84.063	0.266

Footnote: * indicates statistical significance

The whole (n = 88) comparison of race/ethnicities was analyzed using the independent sample t-test procedure to determine analyze if there is a difference in semester grades (Table 16) between students of color (n = 56) and white

students (n = 32). Of the five subjects, that had an independent sample t-test performed, two out of five subjects were statistically significant (Table 15). The mean differences between each course were Elective mean difference = 0.79, Math mean difference = 4.15, English mean difference = 3.03, History mean difference = 3.563 and the Science mean difference = 2.39. The null hypothesis is not rejected. Overall, students of color and white students had similar grades, except for in Math (t = 2.333, df = 57.459, p = .023) and History (t = 2.121, df = 57.136, p = .035) which were statistically significant that there was a difference between students of color and white students.

Table 15. t-test for whole sample semester grades comparison of students of color and white students.

	Students of Color		White Students				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	97.93	56	98.72	32	1.099	62.365	0.276
Math	83.66	56	87.81	32	2.333	57.459	0.023*
English	86.79	56	89.81	32	1.983	63.525	0.052
History	87.38	56	90.94	32	2.121	60.541	0.035*
Science	90.52	56	92.91	32	1.716	57.136	0.092

Footnote: * indicates statistical significance

MIKE MOSES SAMPLE RELATIONSHIP TO ACADEMIC PERFORMANCE

The Mike Moses only comparison (n = 63) was analyzed using the t-test procedure to determine if the Outdoor Education group (n = 42) had higher grades in the 1st six weeks, on average, than the Technology/Keyboarding group (n = 21).). Of the five subjects, that had an independent sample t-test performed, only the elective was statistically significant (Table 16). The mean differences

between each course were Elective mean difference = 4.15, Math mean difference = 2.61, English mean difference = 1.58, History mean difference = 3.20 and the Science mean difference = 1.04. The null hypothesis is not rejected for all of the subjects, with the exception of the elective course. Overall, the grades for both the outdoor education group and technology/keyboarding group were very close showing that there is not a difference in the academic performance, with the exception of the elective class.

Table 16. t-test for Mike Moses only 1st six weeks grades comparison by group.

	Outdoor Education		Technology/Keyboarding				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	100.00	41	95.85	20	7.268	59.000	0.000*
Math	84.90	41	82.29	21	1.073	37.478	0.145
English	88.68	41	87.10	21	0.709	33.092	0.242
History	90.44	41	87.24	21	1.358	36.256	0.092
Science	92.80	41	91.76	21	0.631	40.679	0.266

Footnote: * indicates statistical significance

The Mike Moses only comparison (n = 63) was analyzed using the t-test procedure to determine if the Outdoor Education group (n = 42) had higher grades in the 2nd six weeks, on average, than the Technology/Keyboarding group (n = 21). Of the five subjects, that had an independent sample t-test performed, only the elective was statistically significant (Table 17). The mean differences between each course were Elective mean difference = 5.10, Math mean difference = 0.00, English mean difference = 1.32, History mean difference = 0.30 and the Science mean difference = 1.38.

Table 17. t-test for Mike Moses only 2nd six weeks grades comparison by group.

	Outdoor Education		Technology/Keyboarding				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	100.00	41	94.90	20	5.029	59.000	0.000*
Math	87.10	41	87.10	20	-0.001	42.124	0.500
English	89.27	41	87.95	21	0.503	29.995	0.310
History	88.54	41	88.24	21	0.125	45.061	0.451
Science	91.73	41	90.35	20	0.662	35.746	0.257

Footnote: * indicates statistical significance

The null hypothesis is not rejected for all of the subjects, with the exception of the elective course. Overall, the grades for both the outdoor education group and technology/keyboarding group were very close showing that there is not a difference in the academic performance, with the exception of the elective class.

The Mike Moses only comparison (n = 63) was analyzed using the t-test procedure to determine if the Outdoor Education group (n = 42) had higher grades in the 3rd six weeks, on average, than the Technology/Keyboarding group (n = 21). Of the five subjects, that had an independent sample t-test performed, only the elective was statistically significant (Table 18). The mean differences between each course were Elective mean difference = 2.86, Math mean difference = 0.50, English mean difference = 1.17, History mean difference = 1.37 and the Science mean difference = 0.18. The null hypothesis is not rejected for all of the subjects, with the exception of the elective course. Overall, the grades for both the outdoor education group and technology/keyboarding group were very close showing that there is not a difference in the academic performance, with the exception of the elective class.

Table 18. t-test for Mike Moses only 3rd six weeks grades comparison by group.

	Outdoor Education		Technology/Keyboarding				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	100.00	41	97.14	21	3.399	60.000	0.000*
Math	86.12	41	86.62	21	-0.200	39.745	0.422
English	89.22	41	88.05	21	0.557	33.592	0.291
History	89.61	41	88.24	21	0.588	42.963	0.280
Science	90.56	41	90.38	21	0.111	45.778	0.456

Footnote: * indicates statistical significance

The Mike Moses only comparison (n = 63) was analyzed using the t-test procedure to determine if the Outdoor Education group (n = 42) had higher semester grades, on average, than the Technology/Keyboarding group (n = 21). Of the five subjects, that had an independent sample t-test performed, only the elective was statistically significant (Table 19). The mean differences between each course were Elective mean difference = 4.24, Math mean difference = 0.90, English mean difference = 1.24, History mean difference = 1.70 and the Science mean difference = 0.97.

Table 19. t-test for Mike Moses only semester grades comparison by group.

	Outdoor Education		Technology/Keyboarding				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	100.00	41	95.76	21	6.058	60.000	0.000*
Math	86.00	41	85.10	21	0.410	38.731	0.342
English	89.00	41	87.76	21	0.626	30.907	0.268
History	89.56	41	87.86	21	0.802	42.677	0.214
Science	91.73	41	90.76	21	0.629	41.232	0.267

Footnote: * indicates statistical significance

The null hypothesis is not rejected for all of the subjects, with the exception of the elective course. Overall, the grades for both the outdoor education group and technology/keyboarding group were very close showing that there is not a difference in the academic performance, with the exception of the elective class.

The Mike Moses only (n = 63) comparison of genders was analyzed using the t-test procedure to determine analyze if there is a difference in semester grades (Table 20) between male students (n = 29) and female students (n = 33). The mean differences between each course were Elective mean difference = 0.16, Math mean difference = 3.17, English mean difference = 1.15, History mean difference = 1.07 and the Science mean difference = 0.04. The null hypothesis is not rejected. Overall the male and female students did not have a statistically significant difference in any subject.

Table 20. t-test for Mike Moses only semester grades comparison by gender.

	Male		Female				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	98.48	29	98.64	33	-0.183	59.899	0.855
Math	87.38	29	84.21	33	1.605	56.769	0.114
English	89.24	29	88.09	33	0.643	58.917	0.523
History	89.55	29	88.48	33	0.517	58.840	0.607
Science	91.38	29	91.42	33	-0.030	59.414	0.976

Footnote: * indicates statistical significance

The Mike Moses only (n = 63) comparison of race/ethnicities was analyzed using the t-test procedure to determine analyze if there is a difference in semester grades between white students (n = 26) and students of color (n = 36). It was split like this for analysis to protect the identities of students in lower

represented races or ethnicities. The population varies due to absences and students who moved during the semester. Of the five subjects, that had an independent sample t-test performed, one out of five subjects were statistically significant (Table 21). The mean differences between each course were Elective mean difference = 0.42, Math mean difference = 4.57, English mean difference = 2.56, History mean difference = 3.27 and the Science mean difference = 2.75. The null hypothesis is not rejected. Overall, students of color and white students had similar grades, except for in Math (t = 2.258, df = 51.596, p = .028) which was statistically significant that there was a difference between students of color and white students.

Table 21. t-test for Mike Moses only population semester grades comparison by white or person of color.

	Students of Color		White Students				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	98.39	36	98.81	26	0.486	51.184	0.629
Math	83.78	36	88.35	26	2.258	51.596	0.028*
English	87.56	36	90.12	26	1.469	57.980	0.147
History	87.61	36	90.88	26	1.574	50.524	0.122
Science	90.25	36	93.00	26	1.813	44.527	0.077

Footnote: * indicates statistical significance

MCMICHAEL SAMPLE RELATIONSHIP TO ACADEMIC PERFORMANCE

The McMichael only comparison (n = 26) was analyzed using the t-test procedure to determine if the Outdoor Education group (n = 19) had higher grades in the 1st six weeks, on average, than the Technology/Keyboarding group

(n = 7). Of the five subjects, that had an independent sample t-test performed, the elective and science were statistically significant (Table 22).

Table 22. t-test for McMichael only 1st six weeks grades comparison by group.

	Outdoor Education		Technology/Keyboarding				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	99.11	19	93.71	7	3.462	8.426	0.004*
Math	82.42	19	85.29	7	-0.869	20.817	0.198
English	87.53	19	91.86	7	-1.470	15.602	0.081
History	90.58	19	93.86	7	-1.482	15.911	0.079
Science	89.47	19	94.86	7	-1.799	24.000	0.043*

Footnote: * indicates statistical significance

The mean differences between each course were Elective mean difference = 5.40, Math mean difference = 2.87, English mean difference = 4.33, History mean difference = 3.28 and the Science mean difference = 5.39. The null hypothesis is not rejected for all of the subjects, with the exception of the elective (t = 3.462, df = 8.426, p = .004) and science (t = -1.799, df = 24.000, p = .043). Overall, the grades for both the outdoor education group and technology/keyboarding group were very close showing that there is not a difference in the academic performance, with the exception of the elective and science classes.

The McMichael only comparison (n = 26) was analyzed using the t-test procedure to determine if the Outdoor Education group (n = 19) had higher grades in the 2nd six weeks, on average, than the Technology/Keyboarding group (n = 7). Of the five subjects, that had an independent sample t-test performed, science was the only statistically significant (Table 23).

Table 23. t-test for McMichael only 2nd six weeks grades comparison by group.

	Outdoor Education		Technology/Keyboarding				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	95.68	19	98.43	7	-1.642	21.926	0.058
Math	84.84	19	87.29	7	-0.699	24.000	0.246
English	84.89	19	87.71	7	-0.886	14.037	0.195
History	84.42	19	86.71	7	-0.749	14.759	0.233
Science	90.68	19	96.14	7	-1.731	24.000	0.048*

Footnote: * indicates statistical significance

The mean differences between each course were Elective mean difference = 2.75, Math mean difference = 2.45, English mean difference = 2.82, History mean difference = 2.29 and the Science mean difference = 5.46. The null hypothesis is not rejected for all of the subjects, with the exception of science (t = -1.731, df = 24.000, p = .048). Overall, the grades for both the outdoor education group and technology/keyboarding group were very close showing that there is not a difference in the academic performance, with the exception of science.

The McMichael only comparison (n = 26) was analyzed using the t-test procedure to determine if the Outdoor Education group (n = 19) had higher grades in the 3rd six weeks, on average, than the Technology/Keyboarding group (n = 7). Of the five subjects, that had an independent sample t-test performed, none were statistically significant (Table 24). The mean differences between each course were Elective mean difference = 1.61, Math mean difference = 2.18, English mean difference = 4.11, History mean difference = 5.47 and the Science mean difference = 5.13.

Table 24. t-test for McMichael only 3rd six weeks grades comparison by group.

	Outdoor Education		Technology/Keyboarding				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	97.39	18	99.00	7	-1.189	16.239	0.126
Math	82.11	18	84.29	7	-0.743	18.891	0.233
English	82.89	18	87.00	7	-1.447	16.682	0.083
History	85.67	18	91.14	7	-1.687	12.679	0.058
Science	89.44	18	94.57	7	-1.511	23.000	0.072

Footnote: * indicates statistical significance

The null hypothesis is not rejected for all of the subjects. Overall, the grades for both the outdoor education group and technology/keyboarding group were very close showing that there is not a difference in academic performance.

The McMichael only comparison (n = 26) was analyzed using the t-test procedure to determine if the Outdoor Education group (n = 19) had higher semester grades, on average, than the Technology/Keyboarding group (n = 7). Of the five subjects, that had an independent sample t-test performed, only the science class was statistically significant (Table 25).

Table 25. t-test for McMichael only semester grades comparison by group.

	Outdoor Education		Technology/Keyboarding				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	97.47	19	97.14	7	0.328	20.095	0.373
Math	83.32	19	85.57	7	-0.829	18.674	0.209
English	85.16	19	88.71	7	-1.448	15.940	0.084
History	86.95	19	90.57	7	-1.559	16.085	0.070
Science	89.89	19	95.29	7	-1.822	24.000	0.041*

Footnote: * indicates statistical significance

The mean differences between each course were Elective mean difference = 0.33, Math mean difference = 2.25, English mean difference = 3.55, History

mean difference = 3.62 and the Science mean difference = 5.39. The null hypothesis is not rejected for all of the subjects, with the exception of science (t = -1.822, df = 24.000, p = .041). Overall, the grades for both the outdoor education group and technology/keyboarding group were very close showing that there is not a difference in the academic performance, with the exception of science.

The McMichael only (n = 26) comparison of genders was analyzed using the t-test procedure to determine analyze if there is a difference in semester grades (Table 26) between male students (n = 15) and female students (n = 11). The mean differences between each course were Elective mean difference = 2.01, Math mean difference = 7.22, English mean difference = 4.21, History mean difference = 3.91 and the Science mean difference = 4.91. The null hypothesis is not rejected. Overall the male and female students did not have a statistically significant difference in any subject, except for math (t = -2.619, df = 24.000, p = .015.

Table 26. t-test for McMichael only semester grades comparison by gender.

	Male		Female				
Course	Mean (M)	n	Mean (M)	n	t	df	p value
Elective	96.53	15	98.55	11	-1.809	24.000	0.083
Math	80.87	15	88.09	11	-2.619	24.000	0.015*
English	84.33	15	88.55	11	-1.729	23.987	0.097
History	86.27	15	90.18	11	-1.599	22.037	0.124
Science	89.27	15	94.18	11	-1.854	24.000	0.076

Footnote: * indicates statistical significance

The McMichael only (n = 26) comparison of race/ethnicities was analyzed using the t-test procedure to determine analyze if there is a difference in

semester grades between white students (n = 6) and students of color (n = 20). It was split like this for analysis to protect the identities of students in lower represented races or ethnicities. The population varies due to absences and students who moved during the semester. Of the five subjects, that had an independent sample t-test performed, none were statistically significant (Table 27). The mean differences between each course were Elective mean difference = 1.23, Math mean difference = 2.05, English mean difference = 3.10, History mean difference = 4.22 and the Science mean difference = 1.50. The null hypothesis is not rejected. Overall, students of color and white students had similar grades in all five subjects.

Table 27. t-test for McMichael only semester grades comparison by students of color and white students.

	Students of Color		Students of Color				
Course	Mean (M)	n	Mean (M)	N	t	df	p value
Elective	97.10	20	98.33	6	0.966	9.218	0.359
Math	83.45	20	85.50	6	0.461	6.523	0.660
English	85.40	20	88.50	6	0.995	24.000	0.329
History	86.95	20	91.17	6	1.760	11.833	0.104
Science	91.00	20	92.50	6	0.432	7.708	0.678

Footnote: * indicates statistical significance

Variable Interactions

The two-way ANOVA procedure was used to ascertain if there were any interactions between the independent variables: group (Outdoor Education and Technology/Keyboarding), School (Mike Moses and McMichael), and Race (White Students and Students of Color). The interactions were tested using the

dependent variables connection to nature score and grades. The goal was to see if there was to see if amongst the variables a statistical interaction could have influenced these two dependent variables. For the dependent variable connection to nature scores there were no statistically significant findings in the two-way ANOVA procedure (Table 28).

Table 28. Results of two-way ANOVA for variable interactions on connection to nature scores.

Variable Interaction	p-value
Group with School	0.345
School with Gender	0.276
School with Race	0.894
Gender with Group	0.581
Gender with Race	0.208
Group with Race	0.150

Footnote: * indicates statistical significance

For the dependent variable grades there was only one interaction that yielded statistical significance (Table 29). None of the variables within this study showed much of an interaction except for the interaction of group and school on student grades. This reflects the results what was seen in the t-tests of the previous section.

Table 29. Results of two-way ANOVA for variable interactions on grades.

Variable Interaction	p-value
Group with School	0.007*
School with Gender	0.218
School with Race	0.634
Gender with Group	0.404
Race with Gender	0.062
Race with Group	0.551

Footnote: * indicates statistical significance

Qualitative Analysis

The Qualitative analysis was broken down by the different types of measures used throughout this study by the researcher. The measures are the Pre- and post-study, parental opinions survey, and connection to nature measure (open-ended questions).

PRE, POST, AND PARENTAL OPINIONS

The Pre, Post, and Parental opinion surveys were lumped together for analysis to determine themes regarding the general attitudes the students and parents have towards school, outdoor education, and what students do after school. The questions used from the Pre-study survey are found in Appendix F. The questions used from the Post-study survey are found in Appendix G. The questions used from the Parental opinion survey are found in Appendix D. The pre and post-study have nearly identical questions in order to analyze any change in general themes from the beginning of the study to the end of the study. The Parental opinion survey is included here along with the qualitative analysis for the pre and post-study surveys due to the small response size, as well as the similar thematic concepts noted in the responses. The questions are broken into groups based on similar topics, such as, school related questions, class related questions, and after school related questions. This was done in order to show the similar themes amongst the questions (Table 30).

Table 30. Themes from Pre, Post, and Parental opinion surveys.			
Questions	Themes	Associations	Examples
"Do you have a hard time paying attention in school all day?" "If you could change one thing about school what would it be?" "How long does your child spend on visual technology entertainment per day on average?"	Behavior	No Bullying	*"The bullying system" – SID# 1277*
		School Rules	*"To use our phones in school" – SID# 2214*
	Enjoyment	Want to Succeed Teaching	*"we should get like more freedom and less pressure" –SID# 1115*
		Unexpended Energy	*"Let the 7th and 8th grade and 6th have recess. I know we have work but still we need to go outside sometimes." – SID# 1171*
	Attention	Teaching Avoid distractions	*"No, because I want to get good grades" – SID# 2178*
		Tired Unexpended Energy	*"yes, because I'm tired" – SID# 2119*
"Do you think participating in outside activities is exciting?" "What are you looking forward to/enjoyed about this class?" "Do you think this outdoor education class will help your child?"	Enjoyment	Fun Learning Typing Faster Archery	*"Learning how to go through trails" – SID# 2148* *"Yes, I think she will learn additional reasons to be outside and to appreciate nature." – Parent #12*
	Behavior	Being outside	*"going outside" – SID# 2130*
	Attention	Learning w/o worksheets	*"The projects" – SID# 2279*
	Movement	Being outside Archery	*"Yes, because I'm tired of being inside" – SID# 1129*

"What do you do when you are outside and for how long on average?" "What kind of extracurricular activities do you participate in?" "Does your child participate in extracurricular activities?" "Do you think participating in outside activities is exciting?"	Movement/Exercise	Sports Play with animals and friends Explore	*"I do cheer, skeet shooting, volleyball, and I do swimming." – SID# 2124* *"I go on bike rides, walk, run, play golf, work out." – SID# 2186*
	Relaxation	Play with animals and friends	*"I do think that participating in outdoor activies is fun because most of the day your inside at a desk, and once you get outside you get a break." – SID# 2259*
	Exciting/Fun	Socialize Explore Play with animals and friends	*"I run around with my dogs and play wall ball. I spend about 30 miinutes a day." – SID# 2280*
	Free Freedom/Judgment	Socialize Explore Play with animals and friends	*"Yes, because usually it's quieter, and I get to be in the open and be FFREEE!" – SID# 2120*
"How long does your child typically spend outside per day on average?" "What do you do when you are outside and for how long on average?"	Not Enough	10-30 minutes	*"1-2 hours or more on weekends." – Parent #2* *"10 minutes - 1 hour" Parent #7*
	Variable	1-3 hours 2+ hours	*"Like 2 or 3 hours I play basketball or watch my dog." – SID# 1129* *"Usually about 30-60 minute." – SID# 2168*
	Plenty	3-5 hours	*"I stay outside until I go to bed (8:00) and weekends I stay outside but I don't go to bed at 8:00." – SID# 1171*

The themes related to the questions: “Do you have a hard time paying attention in school all day?”, “If you could change one thing about school what would it be?”, “How long does your child spend on visual technology entertainment per day on average?” were behavior in school, attention in school, and enjoyment of school. The themes related to the questions of: “Do you think participating in outside activities is exciting?”, “What are you looking forward to/enjoyed about this class?”, “Do you think this outdoor education class will help your child?” were the same as the previous themes with the addition of movement (in reference to the outdoor education class). The themes for the questions of: “What do you do when you are outside and for how long on average?”, “What kind of extracurricular activities do you participate in?”, “Does your child participate in extracurricular activities?” were Movement/Exercise, Relaxation, Exciting/Fun, and Freedom/Judgment Free. The themes for the questions of: “How long does your child typically spend outside per day on average?” and “What do you do when you are outside and for how long on average?” were more variable in the amount of time with estimations between 10 minutes and 5 or more hours, depending on weather, time of year, and school.

An aggregate of themes derived from the pre- and post-study surveys was used to compare the themes from the outdoor education students and the technology/keyboarding students. This was to see if there were any major differences in themes. Table 31 covers the comparison of themes seen between the outdoor education and technology/keyboarding students. Between the two groups, there are many common themes between the two in regards to being

outside and school learning. The main difference between the two groups is that the technology/keyboarding group had a theme of lazy/unathletic appear several times amongst the students. They did not report that they did not enjoy the outside still or it as a part of learning, but that their own attitude and physical condition makes it less enjoyable.

Table 31. Comparison of Themes between Outdoor Education and Technology/Keyboarding Students			
Outdoor Education Themes	Examples	Technology/ Keyboarding Themes	Examples
Fun/Exciting	*"I do think that participating in outside activities is exciting because being outside is just more fun, especially for learning." – SID# 1164* *"Yes. Participating outside has plenty of opportunities, it helps make me stronger mentally and physically, it helps me clear my head just by breathing." – SID# 1165* *"Yes, because I do not like sitting inside and doing something else, I like to be active" – SID# 2116* *"Yes because going outside is where I live." – SID# 2119*	Fun/Exciting	*"Yes, I get to have fresh air after staying inside for some time." – SID# 2268* *"Yes, because we don't always have to sit down or just stare at y'all we can experience more things." – SID# 1223* *"Yes, it gets everyone active and social." – SID# 2241* *"Yes, I think it is exciting because I love nature." – SID# 2250* *"I do think that participating in outdoor activities is fun because most of the day your inside at a desk, and once you get outside you get a break." – SID# 2259* *"Yes, you can't just sit in front of a computer all day." – SID# 2291*
Good for physical and mental health		Exercise	
Free Play/Socialize		Free play/Socialize	
Movement		Movement	
Freedom		Freedom	
Break from school		Break from school	
Energy release Better than inside Better learning	*"Yes because it may help with school" – SID# 2137* *"Yes, you get to learn and explore new things." – SID# 2148*	Lazy/Unathletic Weather dependent Fresh air	*"No, I don't like cold or hot weather I hate when it's too cold or too hot." – SID# 1298* *"No I don't like going outside." – SID# 2214*

CONNECTION TO NATURE MEASURE THEMES

The addition of open-ended questions to the connection to nature measure (Cheng and Monroe, 2012) were used to make associations to why the students' scores were the way they were. Also, to see what the students think about the outside and the environment in general. The questions used for this qualitative analysis were: "What do you like to do when you are outside?", "Do you feel confident outside? Why or why not?", and "If you could change one thing (good or bad) about the environment what would it be?" Table 32 shows the themes analyzed from the connection to nature measure open-ended questions. The themes for the question "What do you when you are outside?" shows that the students of this study often spend their time outside in free play and exploration of the outdoors. This question had few negative remarks that consisted mostly of "I do not go outside" or "I'm lazy." To the question "Do you feel confident outside? Why or why not?" showed some similar themes between the students who did feel confident and those who did not. The main themes were Safety, Feeling judged or Judgement free, and Familiarity. For the themes associated with the question "If you could change one thing (good or bad) about the environment what would it be?" were: pollution, animal welfare/safety, human attitudes, Eliminate pest insects, and Global Warming. Overall the themes from these three questions show that the students of this sample spend time outside regularly engaging in free play and exploration, are confident depending on the situation, and are very aware of environmental issues on a global scale.

Table 32. Themes from Connection to Nature measure open-ended questions.		
Questions	Themes	Examples
What do you like to do when you are outside?	Play* Garden Exercise Observe/Explore* Shooting (Guns, bows, etc.)	*"Play and run around with my friends." – SID# 1131* *"I like to look around and play outside." – SID# 1223* *"I like to play with my puppy, play tag, run, play basketball." – SID# 2250.* *"Fish, hunt, swim, shoot." – SID# 2120*
Do you feel confident outside? Why or Why not	<u>YES</u> Sense of Freedom Safety* Familiarity* Judgement Free*	*"Yes, because I am free." – SID# 1162* *"Yes, because I know that they cannot tell me what to do or judge me." – SID# 1223* *"I do feel confident outside because I can relieve my stress." – SID# 2121* *"Yes, because it feels safe." – SID# 2130*
	<u>NO</u> Insects Safety* Familiarity* Feeling Judged*	*"No, because too many cars pass by." – SID# 1143* *"No, because people judge me." – SID# 1277* *"No, because something might hurt you." – SID# 2110* *"No, because there are bees, wasp, mosquitoes, and more." – SID# 2166*
If you could change one thing (good or bad) about the environment what would it be?	Pollution* Animal Welfare/Safety Human Attitudes* Eliminate Pest Insects Global Warming	*"It would be to quit destroying the Earth and quit destroying animal's natural habitat." – SID# 2144* *"I would like our environment to be a lot cleaner." – SID# 2158* *"I would hange people littering and contaminating animals home and their food and water source." – SID# 2280* *"The bad things people are doing to it. –deforestation-population-global warming-killing animals-sometimes just for fun." – SID# 1164*

BEHAVIOR DATA

There was not an analysis for themes in the behavior assessment data due to a lack of qualitative data. There was not enough data overall, to conduct any behavioral that would yield any findings. This was due to multiple issues that arose during the course of the study that were unforeseen by the researcher, such as missing data and the class dojo app deleting data every three weeks. Upon further review of what data there were it was noted by the researcher there was skewed or inaccurate data due to students filling out the behavior assessment incorrectly. However, even with the lack of behavioral data the researcher kept a journal during his visits. These recordings are shown on Table 33, and serve to give at least some data on which inferences can be made about the general behavior of the students.

Table 33. Observations during site visits for survey administration.

Date	Location	Observation
13SEP2018	Mike Moses Middle School	Students seemed very respectful towards others and their teachers. Teachers said that this group so far was much better behaved than last years students.
14SEP2018	McMichael Middle School	Fight almost broke out between two girls a few minutes prior to 1st period on the way to Outdoor education classroom.
14SEP2018	McMichael Middle School	Students less receptive to the importance of study and disrespectful to teachers.

14SEP2018	McMichael Middle School	Witnessed students pushing the boundaries of what they could get away with in the Technology/keyboarding class.
17SEP2018	Mike Moses Middle School	Students were very well behaved and respectful all day with one student having a slight breakdown in class.
18SEP2018	McMichael Middle School	1st period Technology/Keyboarding students very disrespectful towards substitute with few exceptions. Played computer games all period.
18SEP2018	McMichael Middle School	Outdoor Education students were generally better behaved than the Technology/keyboarding students were all day.
20SEP2018	Mike Moses Middle School	Had a few students in 2nd period Technology/keyboarding being disruptive during lesson.
20SEP2018	Mike Moses Middle School	Outdoor Education students continued to be slightly more well behaved than the Technology/keyboarding students.
27SEP2018	Mike Moses Middle School	Technology/Keyboarding watched a video with headphones and Outdoor Education played washers. Overall good behavior all day in both classes.
28SEP2018	McMichael Middle School	The Technology/Keyboarding class in general continues to be rude and disrespectful towards the teacher.
18OCT2018	Mike Moses Middle School	5th period Outdoor Education class had a few students misbehaving when teacher had to leave for a meeting. Perhaps the teacher is the key to well-behaved students.

18OCT2018	Mike Moses Middle School	5th period Technology/Keyboarding had to have one student taken to the office by teacher.
01NOV2018	Mike Moses Middle School	1st period was louder than normal today and continued to talk during film in Outdoor Education.
01NOV2018	Mike Moses Middle School	2nd period was talkative as well, but quieted down once the movie started. Same disrespectful student in Technology/Keyboarding as usual.
01NOV2018	Mike Moses Middle School	I believe the behavior issues are due to the weather being rainy where the kids cannot go outside for a lesson, hence the unusual talkative behavior during class.
30NOV2018	McMichael Middle School	Technology/Keyboarding had a very apparent negative attitude towards my being there again, which could skew data.
30NOV2018	McMichael middle School	Had a few students in outdoor Education disruptive during instructions prior to archery lesson. I believe they were mostly the athletes since that is most of the class in 2nd period.
30NOV2018	McMichael Middle School	"*Having a substitute is hard in outdoor education because of the bonding that goes on. I'm not exactly gonna trust a sub to hand kids a bow and arrow.*" – Terry Huval, Outdoor Education Teacher.

It can be seen from those short entries that, generally speaking, the Outdoor Education students were more well behaved at both schools, from the researcher's view. Also, that the students overall at Mike Moses Middle School were more well behaved than at McMichael Middle School from the researcher's

observations. These data only consist of short observations though and do not constitute concrete evidence of student behavior between the Outdoor Education class and the Technology/keyboarding class or the two middle schools. There could be some unconscious bias from the researcher upon the observations, which is why these observations can only be used as anecdotal information at best.

DISCUSSION

Outdoor education has value in schools as a positive influence on students. The results of the data analysis did not yield any significant findings to definitively state that there is a relationship between outdoor education and academic performance or behavior. However, the qualitative analysis reveals that students view the involvement of outdoor activities in a learning environment as fun and that it serves to break up the monotony of the school day. This brief outdoor exposure, the researcher believes, holds value on the positive influence outdoor education has on students in a school setting. There are many factors that are unclear when it comes to the influence of outdoor education in comparison to technology/keyboarding on students. More research is necessary to truly find if outdoor education has a positive relationship to academic performance and behavior in comparison to technology/keyboarding or other elective courses.

Connection to Nature

The results for the connection to nature measure (Cheng & Monroe, 2012) yielded varying instances of non-statistically significant measures and statistically significant measures. This shifted depending on what variable was being tested,

but overall was relatively consistent. The mean differences however are where the real interest is due to the statistical significance varying so widely in each comparison. In most cases for comparison, the mean differences produced from the t-tests were consistent with the hypothesis being tested. Therefore, even though the research hypotheses could not always be proven the mean differences show that there is reason to believe that there is a difference between the outdoor education and technology/keyboarding students' connection to nature.

GROUP AND CONNECTION TO NATURE

The whole group comparison between outdoor education and technology/keyboarding did not yield a single instance of statistical significance from any of the three measures conducted or the overall average score between the three measures. However, the first two connection to nature measures and the overall average score yielded mean differences that were in line with the hypothesis that the outdoor education students would have a higher connection to nature, on average. Although the difference is not statistically significant, there is indeed a difference between the students in outdoor education and the technology/keyboarding students. An influence that shifted the CN #3 measure could have been the repetition of the measure administration by the researcher. Through on-campus observations during the study, it was noted by the researcher that towards the end of the study there was a bit of disdain from the students toward the researcher's presence. This means that the students whose

data was used could have been rushed and been inaccurate based on the fact they wanted to be done with the measure and get back to what they were previously engaged with in class.

Moving onto the two individual schools (Mike Moses Middle School and McMichael Middle School) only one case from the t-test procedure showed statistical significance, although it was in favor of the Technology/Keyboarding group having a higher connection to nature score. Again, this could have been influenced from the repetition of the measures administration at both schools, but this can only be inferred from the researcher's observations. Overall, the mean differences were typically in favor of the research hypothesis of the outdoor education students having a higher connection to nature score, on average, than the technology/keyboarding students.

Using the Mike Moses only group comparison data it showed two instances (CN #1 and CN #3) of where the mean differences were in favor of the technology/keyboarding group students having a higher connection to nature score. Both groups may show a similar connection to nature score through the connection to nature measure developed by Cheng and Monroe (2012) due to the location of the study being in a small rural city. However, the overall average score shows that, although near insignificant, the outdoor education students do have a higher connection to nature, on average, than the technology/keyboarding students.

Using the McMichael only group data none of the results from the t-test procedure showed statistical significance. However, the mean differences were

consistent with the research hypothesis overall. The McMichael only group had the smaller population with only 26 total students (17 outdoor education and 9 technology/keyboarding) in the sample pool. Had there been a larger sample size the researcher believes that there may have been some instances of statistical significance in the connection to nature scores. This is inferred from the data having two of the measures (CN #1 and the overall average) being just outside of statistical significance ($p \leq .05$).

Overall the average scores for the connection to nature measure were consistent with the research hypothesis, although not statistically significant. With the data having such wide fluctuations in the mean connection to nature scores in each group, the experiment should be repeated again with a larger sample size at both schools and a slight modification to the methodology used in regards to the connection to nature measure. A theory of the researcher's on this is that due to it being a small rural city the scores are higher and more even between the groups and schools because the participant's all have about equal exposure to the outdoors through play and such at home. This could be a leading reason as to why there were not many statistically significant findings and the wide fluctuations in the mean connection to nature scores. Another theory is that since hunting season began during the study it may have caused the scores to increase in the participants that hunt once the season begin, thus having an effect on the connection to nature scores.

GENDER AND CONNECTION TO NATURE

There were statistically significant differences in connection to nature scores between male and female students. In each comparison, whole population, Mike Moses only population, and McMichael only population, the female students had a higher connection to nature score than the male students did. Female students during all three measures and the average score was higher by at least 0.156 points at the lowest. The female students having a higher connection to nature score is in line with most of the literature on gender and connection to nature scores, although one study showed that males have a higher score (Larson et al., 2018).

RACE/ETHNICITY AND CONNECTION TO NATURE

There were only two instances of statistically significant data in the comparison of races. However, the researcher again believes this was due to some sort of outside influence, such as outdoor based extracurricular organizations. The reason for that is when looking at the data presented the connection to nature scores for students of color versus white students the scores were variable in each measure conducted. It is likely there is not a difference in the connection to nature scores between students of color and white students in this study. Although, this cannot be confirmed without repeated testing when looking at the qualitative data the vast majority of students, regardless of race, enjoy playing outside and do so regularly. Upon considering

this it is more likely that there may be a slight variance in the mean differences, but in general there would not be a significant difference in connection to nature between white students and students of color. There may be bias to the scale in regards to particular races/ethnicities and gender, but this cannot be confirmed nor denied within the bounds of this study.

Relationship to Academic Performance

The academic performance testing did not produce any significant findings. Overall, there was not a statistically significant instance that students in the outdoor education had higher grades, on average, than the technology/keyboarding students. There were a few cases of statistically significant findings amongst the three samples. However, this is not enough to concretely say there is a statistically significant difference because the results are not consistent. The mean differences between the outdoor education students and the technology/keyboarding students depending on which sample analyzed were more consistent with the research hypothesis, and some that were consistent with the null hypothesis. It is likely that part of this is due to the small sample sizes that were used in this study; had the sample sizes been larger it would have strengthened the quality of the study data. A potential reason for there being no consistent statistically significant findings is that there is no relationship between academic performance and being in an outdoor education class. There are studies that have shown that students participating in an outdoor education class perform academically better in science classes, however this has

mostly been based on observations or study specific tests and not actual school grades. This study should be repeated again on a larger scale with schools from urban and suburban areas as well. This would present a more accurate picture on if there is a relationship between outdoor education and academic performance.

Relationship to Behavior in School

Due to the unforeseen issues that arose during the study in regards to the behavior data the only data utilized was the researcher's observation notes. The researcher has made a few assumptions based upon observations during the study to present as suggestions for future research. Student behavior is related to many variables that would be difficult to observe using the methods from this study. Student behavior seemed to be affected by things, such as, time of day, lesson of the day, and even the school climate. The time of day was a variable due to how awake the students were. If it was early morning or late afternoon the students were typically less focused and attentive to the lessons. This can also be seen in the qualitative analyses when the students were asked, "Do you have a hard time paying attention in school all day?" in the themes of 'tired' and 'unexpended energy'. The lesson of the day also seemed to have an effect on how attentive, focused, and behaved the students were for the class period. If the lesson was 'boring' in the eyes of the students, they were more prone to being disruptive through talking and horse playing. This along with the time of day on some of the researcher's visits almost had a compound effect on the overall

behavior of the class. Between the two schools the researcher noticed that there is definitely a different school culture amongst the students comparatively. At one of the schools the students seemed to demonstrate behaviors considered to be positive in general with a few issues on occasion and the other constantly had students who would push the boundaries of rules with teachers and other students. This does not account however, for when there were no observations happening at the schools. Therefore, the prior statements can only be taken as the observations they are and not concrete facts.

Qualitative data themes

The current thought process in outdoor education research in the last decade has followed the examples written by Richard Louv (2008) in “Last Child in the Woods.” Louv claims that children are going outside less and staying inside more, thereby developing what he coined as Nature Deficit Disorder (NDD). Although this has been the mindset for outdoor education related research for the last decade the qualitative data from this research seems to depict a different story. The themes seen in this study show that although the children do want the ability to use their phones more freely in a school setting, indicating a love of technology, they equally, on average, spend time outside engaged in different forms of play. The participants of this study noted they regularly play outside. Whether this was riding their bicycle, playing sports and games with friends, or simply reading on their front porch they are engaging with

the outdoors. This seems to indicate the exact opposite of what Louv (2008) wrote about. This is not to say this mindset in regards to research testing the NDD hypothesis is the wrong direction to pursue, but it may have become biased over time. This study was conducted in a small rural city. Having easier access to “green spaces” may have influence on the fact that the participants of this study showed more active engagement in outside play compared to children in more developed urban areas. This study has shown that maybe more research is needed on how Gen Z engages with the outdoors in comparison to the many anecdotal comparisons made to previous generations’ childhood memories. The only way to know is to continue researching this on a larger scale with multiple schools from Urban, Suburban, Sub-rural, and Rural areas and search for the themes and trends amongst Gen Z.

Limitations and Recommendations

There were many factors and outside influences to this study, which is normal for school related research of this nature. With that in mind, there were several factors that affected the results of this study. The main limitations that affected this study boiled down to three factors, the length of the study, the size of the sample population, and multiple substitutes during the course of the study. The study was rather short for data to be efficiently collected and accurate. This study may have been better suited for a more long term study rather than 15 weeks (1 semester). It is recommend that if conducting this study again in the future use a long-term setup of multiple years to gather more data. The next limitation of this

study was the sample size may have led to an inaccurate representation of the average student. Had the sample size been larger the likelihood of the results being more accurate would have increased. This study, if conducted again, should attempt to structure the recruitment of students for a better sample size. Doing so by sending letters directly to homes would possibly result in a better return rate. There could also be some form of incentive for students to ensure that their forms return. Another limitation to this study was that two teachers left during the study period. During the study one of the outdoor education teachers became the assistant principal and one of the technology/keyboarding teachers went on maternity leave. This led to having multiple substitutes during the study, which could have biased the classroom behavior evaluations. In the case of the outdoor education class, their entire curriculum changed midway through the study since the substitutes were not certified to teach certain lessons, such as archery. This may have caused some of the to be skewed during the study. With applied studies such as this it is difficult to prepare for these types of occurrences and possible influences on the study. As a recommendation, if this study were to be repeated there should be an attempt to account or help mediate these situations in some way, if possible.

CONCLUSION

The goal of this study was to test for a relationship between outdoor education and academic performance and behavior. There was no definitive proof that there was a relationship between outdoor education and academic performance or behavior. However, the fact that there was not definitive proof still does not necessarily mean there is no relationship between these variables. When looking at the mean differences there is definitely a consistent relationship between outdoor education and academic performance and behavior. Also, when looking at the qualitative data it can be seen that the participants of this study were more actively engaged in outside play after school than initially thought. This is contrary to popular eld beliefs about Gen Z, and warrants further study. Furthermore, since this was a short-term study with a small sample size, the data may not be accurately representative of the general population of these schools. This study faced many unexpected issues during the study period, which may have skewed the results of the study. It is recommended that further research be conducted again with an improved methodology and over a longer period of time in order to better understand if there is a relationship between outdoor education and academic performance or behavior.

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APPENDIX A

PARENTAL CONSENT FORM

STEPHEN F. AUSTIN STATE UNIVERSITY

Arthur Temple College of Forestry and Agriculture
P. O. Box 6109 SFA Station • Nacogdoches, TX 75962-6109
Phone (936) 468-3301 • Fax (936) 468-2489
http://atcofa.sfasu.edu

Information Statement – Parent/Guardian

Outdoor Education's Relation to Academic Performance and Behavior in School

This research project is being conducted by Trenton A. Stiefel, a graduate student in the Arthur Temple College of Forestry and Agriculture at Stephen F. Austin State University (SFA) to look at outcomes for students who take outdoor education as an elective in middle school compared to those that take other electives. We hope that this research will help to develop a better understanding of how outdoor education relates to behavior and grades in school.

This four month project includes: collection of behavior reports, student grades, short surveys for the student, one survey for the parent/guardian, and a group discussion with the students about their opinions. Only teachers will know the names, grades, and reported behavior of the students. Researchers will only see data where the identity of the student has been removed. The risks for participation in this project are low because all students in the class will complete the surveys (not just the research participants), and all data will be de-identified by the teacher. The teacher will be the only person to know your students' names linked to their grades and behavior reports. Stress is possible from participating in the group discussion, but researchers will work to minimize by creating a positive atmosphere for discussion with the students and teacher.

You must choose to participate, and both the parent and student must agree. Permission can be ended at any time during the study if the parent or student wishes. There is no penalty for leaving the study. All information and responses will not be shared.

By agreeing to participate in this study, you should know that no compensation is available from SFA and its employees for any injury resulting from your student's participation in this study.

Thank you very much for your help. If you have any questions or concerns about this study, please feel free to contact Mr. Trenton Stiefel by telephone at 936-468-1270 or by e-mail at stiefelta@jacks.sfasu.edu or Dr. Shelby Gull Laird by telephone at 936-468-2014 or by e-mail at lairdsg@sfasu.edu . Any concerns with this research may be also be directed to the Office of Research and Sponsored Programs at 936-468-6606.

Thank you again for your help.

Trenton A. Stiefel

Shelby Gull Laird, Ph.D.

Informed Consent Form

Outdoor Education's Relation to Academic Performance and Behavior in School

I agree to let my student take part in this study, which hopes to create a better understanding of how outdoor education relates to student behavior and grading in school. I have had the purpose of the study explained to me, and I have read the Information Statement, which I may keep for my records. I understand that agreeing to take part in this study means that I am willing to:

- Allow my student to have behavior reported and grades shared with researchers.
- Participate in open-ended surveys on my student's opinions.
- Allow my student to take surveys throughout the semester about outdoor education, and
- Allow my student to participate in a group discussion about how they feel about the class.

I understand that any information I provide is confidential, and that no information that could lead to the identification of any individual disclosed in any reports on the study, or to any other party beyond the research team.

I also understand that my student's participation is voluntary, and that I can choose for them not to participate in part or all of the study, and that I can stop my student's participation at any stage of the study without any negative impacts on my student or myself. I understand that after the study is completed, researchers will be unable to remove data collected through our participation in the study.

Stephen F. Austin State University's Institutional Research Board has reviewed this study.

Any concerns with this research can be directed to the lead researcher, Mr. Trenton Stiefel at (936) 468-1270 or by e-mail at stiefelta@jacks.sfasu.edu or the advisor, Dr. Shelby Gull Laird, at (936) 468-2014 or by e-mail at lairdsg@sfasu.edu.

Student's Name: ……

Parent/Guardian's Name: ……

Parent/ Guardian's Signature: ……

Date: ……

Parent/ Guardian's Email: ……

APPENDIX B

PARENTAL CONSENT FORM TRANSLATED INTO SPANISH

STEPHEN F. AUSTIN STATE UNIVERSITY

Arthur Temple College of Forestry and Agriculture
P. O. Box 6109 SFA Station • Nacogdoches, TX 75962-6109
Phone (936) 468-3301 • Fax (936) 468-2489
http://atcofa.sfasu.edu

Declaración de información – padres

Relación de educación al aire libre con el rendimiento académico y comportamiento en la escuela

Este proyecto de investigación está siendo adelantada por Trenton A. Stiefel, un estudiante graduado en la Universidad de silvicultura de Arturo templo y agricultura a Stephen F. Austin estado Universidad (SFA) para mirar los resultados para los estudiantes que toman la educación al aire libre como electiva en medio escuela en comparación con aquellos que toman otros cursos electivos. Esperamos que esta investigación ayudará a desarrollar un mejor entendimiento de la educación como al aire libre se refiere a comportamiento y calificaciones en la escuela.

Este proyecto de cuatro meses incluye: colección de informes de comportamiento, calificaciones de los estudiantes, encuestas cortas para el estudiante, una encuesta para los padres o tutores y una discusión de grupo con los estudiantes acerca de sus opiniones. Sólo los profesores saben los nombres, grados y comportamiento divulgado de los estudiantes. Los investigadores sólo verá datos de donde se ha eliminado la identidad del estudiante. Los riesgos para la participación en este proyecto son bajos porque todos los estudiantes en la clase a completar las encuestas (no sólo los participantes de la investigación), y todos los datos se-identificará por el profesor. El maestro será la única persona que sabe que los nombres de sus estudiantes ligada a sus notas y comportamiento informes. El estrés es posible participar en la discusión de grupo, pero los investigadores trabajarán para reducir al mínimo mediante la creación de una atmósfera positiva para la discusión con los estudiantes y el profesor.

Usted debe elegir participar, y los padres y el estudiante deben estar de acuerdo. Permiso puede terminar en cualquier momento durante el estudio si el padre o el estudiante desea. No hay ninguna pena por dejar el estudio. Toda la información y las respuestas no serán compartidas.

Al aceptar participar en este estudio, usted debe saber que ninguna indemnización es de AGS y sus empleados por los daños resultantes de la participación de los estudiantes en este estudio.

Muchas gracias por su ayuda. Si tiene preguntas o inquietudes sobre este estudio, no dude en comunicarse con el Sr. Trenton Stiefel por teléfono al 936-468-1270 o por correo electrónico a stiefelta@jacks.sfasu.edu o al Dr. Shelby Gull Laird por teléfono a 936-468-2014 o por correo electrónico a lairdsg@sfasu.edu. Cualquier inquietud con esta investigación también puede ser dirigida a la Oficina de Investigación y Programas Patrocinados al 936-468-6606.

Gracias de nuevo por tu ayuda.

Trenton A. Stiefel

Shelby Gull Laird, Ph.D.

Formulario de consentimiento informado

Relación de educación al aire libre con el rendimiento académico y comportamiento en la escuela

estoy de acuerdo en dejar que mi hijo participar en este estudio, que pretende crear un mejor comprensión de la educación al aire libre cómo se relaciona con estudiantes comportamiento y en la escuela. He tenido el propósito de lo estudio me explicó y he leído la declaración de la información, que puedo mantener mis registros. Entiendo que acordaron tomar parte en este estudio significa que estoy dispuesto a:

- Deje que mi estudiante comportamiento informado y grados compartidos con los investigadores.
- Participar en las encuestas abiertas en opiniones de mi estudiante.
- Permitir que mi estudiante tomar encuestas durante el semestre acerca de la educación al aire libre, y
- Deje que mi estudiante participar en una discusión de grupo sobre cómo se sienten acerca de la clase.

Entiendo que cualquier información que proporcione es confidencial, y que ninguna información que pueda conducir a la identificación de cualquier persona revelada en los informes en el estudio, o a cualquier otra parte más allá del equipo de investigación.

También entiendo que la participación de mis estudiantes es voluntaria y que puedo elegir para que no participen en parte o todo del estudio, y que puedo dejar mi de participación en cualquier etapa del estudio sin ningún impacto negativo en mi hijo o yo mismo. Entiendo que una vez finalizado el estudio, los investigadores serán incapaces de eliminar datos recogidos a través de nuestra participación en el estudio.

Junta de investigación institucional de la Universidad Estatal Stephen F. Austin ha revisado este estudio.

Cualquier inquietud con esta investigación se puede dirigir para el investigador principal, el Sr. Trenton Stiefel en (936) 468-1270 o por e-mail a stiefelta@jacks.sfasu.edu o el asesor, el Dr. Shelby Gull Laird, en (936) 468-2014 o por e-mail a lairdsg@sfasu.edu .

Nombre del estudiante: ….....

Nombre del padre o tutor: ….....

Padre / firma tutor: ….....

Fecha: ….....

Padre / correo electrónico tutor: ….....

APPENDIX C

STUDENT CONSENT FORM

STEPHEN F. AUSTIN STATE UNIVERSITY

Arthur Temple College of Forestry and Agriculture
P. O. Box 6109 SFA Station • Nacogdoches, TX 75962-6109
Phone (936) 468-3301 • Fax (936) 468-2489
http://atcofa.sfasu.edu

Information Statement - Student

Outdoor Education's Relation to Academic Performance and Behavior in School

This research project is being conducted by Trenton A. Stiefel, a graduate student in the Arthur Temple College of Forestry and Agriculture at Stephen F. Austin State University (SFA) to look at outcomes for students who take outdoor education as an elective in middle school compared to those that take other electives. We hope that this research will help to develop a better understanding of how outdoor education relates to behavior and grades in school.

This four month project includes: collection of behavior reports, student grades, short surveys for the student, one survey for the parent/guardian, and a group discussion with the students about their opinions. Only teachers will know the names, grades, and reported behavior of the students. Researchers will only see data where the identity of the student has been removed. The risks for participation in this project are low because all students in the class will complete the surveys (not just the research participants), and all data will be de-identified by the teacher. The teacher will be the only person to know your names linked to your grades and behavior reports. Stress is possible from participating in the group discussion, but researchers will work to minimize by creating a positive atmosphere for discussion with the students and teacher.

You must choose to participate, and both the parent and student must agree. Permission can be ended at any time during the study if the parent or student wishes. There is no punishment for leaving the study. All information and responses will not be shared.

By agreeing to participate in this study, you should know that no compensation is available from SFA and its employees for any injury resulting from your participation in this study.

Thank you very much for your help. If you have any questions or concerns about this study, please feel free to contact Mr. Trenton Stiefel by telephone at 936-468-1270 or by e-mail at stiefelta@jacks.sfasu.edu or Dr. Shelby Gull Laird by telephone at 936-468-2014 or by e-mail at lairdsg@sfasu.edu . Any concerns with this research may be also be directed to the Office of Research and Sponsored Programs at 936-468-6606.

Thank you again for your help.

Thank you again for your help.

Trenton A. Stiefel

Shelby Gull Laird, Ph.D.

Informed Consent Form

Outdoor Education's Relation to Academic Performance and Behavior in School

I choose to take part in this study, which hopes to learn about how outdoor education relates to my behavior and grades in school. I have been told the reason for this study, and I have read the Information Statement, which I can keep. I know that by taking part in this study, it means I am willing to:

- Participate by having my behavior reports and grades looked at,
- Participate in surveys on my thoughts and feelings,
- Participate in taking surveys a couple of times during the semester, and
- Participate in a class talk about how I feel about the class.

I understand that anything about me will only be seen by my teacher and the researchers without my name on it. My name and answers will not be known after my teacher removes my name from those papers. Any reports on this study will not ever use my name or something that could let others know who I am.

I also know my participation is my choice, and I can choose not to participate in part or all of the study. I can stop taking part in the study whenever I want without getting in trouble. I know that after the study is completed, researchers will be will not be able to throw away my answers from my participation in the study.

Stephen F. Austin State University's Institutional Research Board has reviewed this study.

Any concerns with this research may be directed to the lead researcher, Mr. Trenton Stiefel at 936-468-1270 or by e-mail at stiefelta@jacks.sfasu.edu or the advisor, Dr. Shelby Gull Laird, at 936-468-2014 or by e-mail at lairdsg@sfasu.edu.

Student's Name: ……...

Student's Signature: ……..

Date: ……..……....

APPENDIX D

PARENT SURVEY: OPINIONS ON OUTDOOR EDUCATION

Parent/Guardian Opinions on Outdoor Education

Student Name: _____
Parent/Guardian Name: _____
Date: _____

1. How do you feel about your child participating in outdoor education?

2. How long does your child typically spend outside per day on average?

3. How long does your child spend on visual technology entertainment per day on average?

4. Does your child participate in any extracurricular activities after school?

   Yes No

   If yes, what kind of activities do they participate in?

5. Do you spend time outside every day?

   Yes No

6. If yes, what do you do when you are outside?

7. Do you think this outdoor education class will help your child? Why or why not?

APPENDIX E

PARENT SURVEY: OPINIONS ON OUTDOOR EDUCATION

TRANSLATED INTO SPANISH

Parent/Guardian Opinions on Outdoor Education

Student Name: _____
Parent/Guardian Name: _____
Date: _____

1. ¿Cómo se siente acerca de su hijo participando en educación al aire libre? (si está tomando actualmente)

2. Cuánto tiempo ¿pasa su niño típicamente fuera por día en promedio?

3. Cuánto tiempo ¿pasa su hijo en el entretenimiento de tecnología visual por día en promedio?

4. ¿Su hijo participa en actividades extracurriculares después de la escuela?
   Sí No

   En caso afirmativo, qué tipo de actividades ¿participan en?

5. ¿Pasas tiempo al aire libre todos los días?
   Sí No

6. Si es así, ¿qué haces cuando estás fuera?

7. ¿Crees que esta clase de educación al aire libre puede ayudar a su hijo? ¿Por qué o por qué no?

APPENDIX F

PRE-STUDY SURVEY: STUDENT OPINIONS ON OUTDOOR EDUCATION

Pre-Study Student Opinions on Outdoor Education
Student Name: _____

Admin Use Only:
Survey ID #_____

1. How does the idea of participating in outdoor activities appeal or not appeal to you?

2. What are you looking forward to most in this class?

3. Do you have a hard time paying attention in school all day? Why or Why not?

4. If you could change one thing about school what would it be?

5. Do you spend time outside after school everyday?

   Yes No

6. If yes, what do you do when you are outside and for how long on average?

7. Do you participate in any extracurricular activities after school?

   Yes No

8. If yes, what kind of extracurricular activities do you participate in?

APPENDIX G

POST-STUDY SURVEY: STUDENT OPINIONS ON OUTDOOR EDUCATION

Post-Study Student Opinions on Outdoor Education
Student Name: _____

Admin Use Only:
Survey ID #_____

1. Do you think participating in outside activities is exciting? Why or why not?

2. What was your favorite part of this class?

3. Do you have a hard time paying attention in school all day? Why or Why not?

4. If you could change one thing at school, what would it be?

5. Do you spend time outside after school every day?

   Yes No

6. If yes, what do you do when you are outside and for how long on average?

7. Do you participate in any extracurricular activities after school?

   Yes No

8. If yes, what kind of extracurricular activities do you participate in?

9. Do you feel that after this class you are more connected to nature/ the outdoors?

APPENDIX H

SAMPLE OPEN FORUM INTERVIEW QUESTIONS

Students and Nature Open Forum Questions

1. When was the last time you went to a natural place?

    a. What type of place did you go to?

    b. How did you feel?

2. Do you think going outside is important?

    a. What are you interested in learning about the outdoors?

    b. Does this class make you feel confident?

    c. Do you prefer to be outside or inside?

    d. Did you choose to be in this class?

APPENDIX I

STUDENT BEHAVIOR SELF-EVALUATION

Student Behavior Self-Evaluation
Student Name: _____

Admin Use Only:
Survey ID #_____

Instructions: Please check the boxes and write out answers to each question. There is no right or wrong answer, just answer each question honestly and to the best of your ability. Your answers will not be used to get you or anyone else in trouble.

My Behavior					
	Not at All	Not Really	Both	Paid Attention	Really Paid Attention
Did I paid attention in class?	☐	☐	☐	☐	☐
How was my behavior during class?	☐	☐	☐	☐	☐
Did you feel the lesson was entertaining/fun?	Yes			No	
Why or why not?					
Did you feel the lesson was boring?	Yes			No	
Why or why not?					
How are you feeling today?					
What was something you learned during class?					
What was something I did that was good (if any) during class?					
What was something I did that was bad (if any) during class?					

APPENDIX J

TEACHER BEHAVIOR EVALUATION

Teacher Class Behavior Evaluation

Teacher Name: _____
Class Period: _____
Date: _____

Instructions: Please fill in the boxes and circle the answers that best describe the class today.

	Worse than Usual	Poor	Same as Usual	Good	Better than Usual
How was engagement for the class period?	☐	☐	☐	☐	☐
How was the overall attention of students for the class period?	☐	☐	☐	☐	☐
How engaging was the material, in your opinion?	☐	☐	☐	☐	☐
How did you feel about the quality of your teaching today?	☐	☐	☐	☐	☐
Did you use any "redirects" today?		Yes		No	
If yes, about how many did you use?	Less than 3		> 3 but < 6		More than 6

Other Thoughts and/or Comments:

APPENDIX K

CONNECTION TO NATURE EVALUATION

Connection to Nature Survey
Student Name: _____

Admin Use Only:
Survey ID #_____

Instructions: Please tell us how much you agree or disagree with each of the following statements, by putting a check in the relevant box. Please write out answers to each open-ended question. There are no right or wrong answers, just be honest and to the best of your ability.

	Strongly Disagree	Disagree	Agree or Disagree	Agree	Strongly Agree
I like to hear different sounds in nature.	☐	☐	☐	☐	☐
I like to see wild flowers in nature.	☐	☐	☐	☐	☐
When I feel sad, I like to go outside and enjoy nature.	☐	☐	☐	☐	☐
Being in the natural environment makes me feel peaceful.	☐	☐	☐	☐	☐
I like to garden.	☐	☐	☐	☐	☐
Collecting rocks and shells is fun.	☐	☐	☐	☐	☐
Being outdoors makes me happy.	☐	☐	☐	☐	☐
I feel sad when wild animals are hurt.	☐	☐	☐	☐	☐
I like to see wild animals living in a clean environment.	☐	☐	☐	☐	☐
I enjoy touching animals and plants.	☐	☐	☐	☐	☐
Taking care of animals is important to me.	☐	☐	☐	☐	☐
Humans are part of the natural world.	☐	☐	☐	☐	☐
People cannot live without plants and animals.	☐	☐	☐	☐	☐
My actions will make the natural world different.	☐	☐	☐	☐	☐
Picking up trash on the ground can help the environment.	☐	☐	☐	☐	☐
People do not have the right to change the natural environment.	☐	☐	☐	☐	☐

Connection to Nature Survey
Student Name: _____

Admin Use Only:
Survey ID #_____

1. What do you like to do when you are outside?

2. What kind of plants do you like to grow in your garden (if you garden)?

3. What kind of wild animals do you enjoy or do not enjoy seeing?

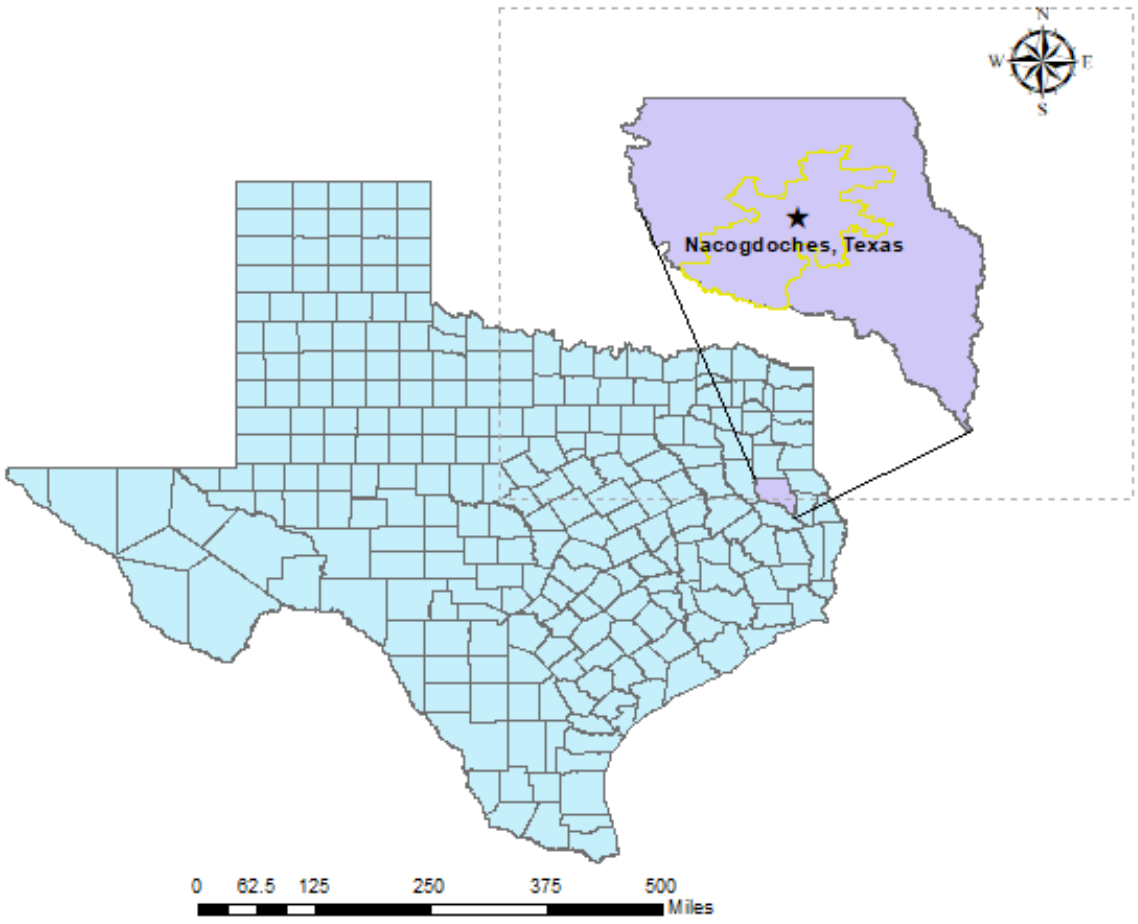
4. Do you feel confident outside? Why or Why not?

5. If you could change one thing (good or bad) about the environment what would it be?

APPENDIX L

MAPS OF NACOGDOCHES INDEPENDENT SCHOOL DISTRICT

Nacogdoches, TX Location and School District Boundaries



City Limits and Boundaries

- Nacogdoches County
- Nacogdoches City Limits

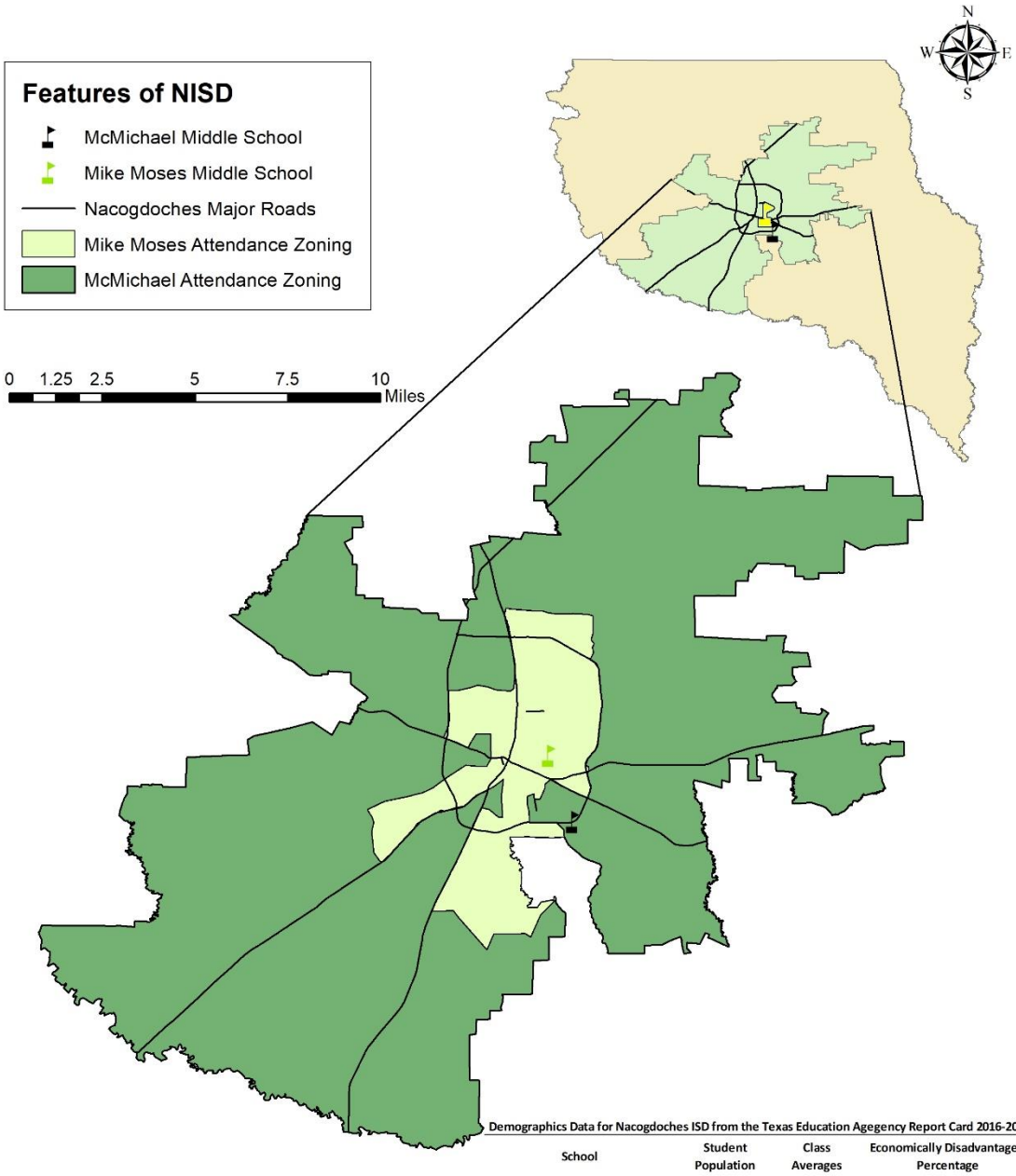
Table 1. Demographics of Nacogdoches County, Texas from the American Census Survey 2017.

Population	Race/Ethnicity	Percent of Population	Households	Person per household	Median Household Income	Poverty Percentage
65,380	Black	18.50%	23,942	2.51	$38,915	25.40%
	Hispanic	19.50%				
	White	59.40%				
	American Indian	0.90%				
	Asian	1.50%				
	Other	0.20%				
Total	All	100.0%				

Geographic Information Systems Laboratory

Created by: Trenton A Stiefel
Created on: 10/31/2018

NISD Middle School Attendance Zones



Demographics Data for Nacogdoches ISD from the Texas Education Agegency Report Card 2016-2017.

School	Student Population	Class Averages	Economically Disadvantaged Percentage
McMichael Middle School	754	19 to 27	82.4%
Mike Moses Middle School	651	18 to 22	79.6%

Arthur Temple College of Forestry and Agriculture
Geographic Information Systems Laboratory

Created by: Trenton A. Stiefel
Created on: 1/2/2019

APPENDIX M

LETTERS OF PERMISSION

NACOGDOCHES ISD
McMICHAEL
Middle School
4330 SE Stalling Dr.
Nacogdoches, TX 75961
936-552-0519

Site Approval Letter for Conducting Research

April 20, 2018

McMichael Middle School
Address: 4330 SE Stallings Dr,
Nacogdoches, TX 75961

To whom it may concern:

This letter acknowledges that I have received and reviewed a request by Mr. Trenton Stiefel of Stephen F. Austin State University to conduct a research thesis project on the classroom benefits of Outdoor Education at McMichael Middle School. This letter is to justify that I grant access for these researchers to conduct their respective research protocol at our facility after they secure the respective IRB approval.

I understand that the research protocol will adhere to all ethical standards of human subject research including the protection from harm and the security of the confidentiality and anonymity of participants. I also understand that I have the right to discontinue the participation of McMichael Middle School in this research project for any reasons that I deem justifiable.

If I have any concerns about this research project, I understand that I may contact Stephen F. Austin State University's Office of Research and Sponsored Programs at 936.468.6606.

Sincerely,

Tim Mullican
Principal
Email: tmullican@nacisd.org
Phone: (936) 552-0519, ext 4110

VITA

After completing his work at Gladewater High School, Gladewater, Texas, in 2011, Trenton A. Stiefel entered Stephen F. Austin State University in Nacogdoches, Texas. During the fall of 2012 until the spring of 2014 he attended Tyler Junior college in Tyler, Texas. He returned to Stephen F. Austin in the spring semester of 2014. He received the degree of Bachelor of Science in Forestry from Stephen F. Austin State University in December 2016. During the next 10 months he entered Basic Combat Training and Advanced Individual Training for the U.S Army Reserve. In August of 2017, he entered the Graduate School of Stephen F. Austin State University, and received the degree of Master of Science in Resource communication in May of 2019.

Permanent Address: 1506 N Alice St
Gladewater, TX 75647

American Psychological Association

This thesis was typed by Trenton A. Stiefel