

INCORPORATING GPS TECHNOLOGY IN GEOGRAPHY CURRICULUM

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ABSTRACT

The reason for writing this capstone is to share information gathered on how incorporating GPS technology throughout seventh grade World Geography curriculum benefits student learning of the *Five Themes of Geography* and spatial literacy. This study included two lessons on GPS technology and a two class period outdoor activity in which students were outdoors using GPS technology to complete a scavenger hunt relating to the *Five Themes of Geography*. In addition students also learned about the history of GPS and Geocaching as well as the main functions of handheld GPS units. While more research needs to be completed, this study concluded that the majority of seventh graders benefited from the incorporation of GPS technology in the seventh grade World Geography curriculum.

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CHAPTER ONE: INTRODUCTION

Development

I grew up in a wide open area surrounded by deciduous forests and fields. We lived in a small family house on the edge of woods. My older brother, dog, dozens of neighborhood kids to play with seemed to create endless summers full of adventurous games and campfires. The excitement of the first snowfall brought a whole new set of activities ranging from sledding to Nordic skiing. Given my surroundings, the changing seasons became part of who I was. The stillness of winter, freshness of spring and the nostalgia of fall continue to shape my thoughts and feelings. As far back as kindergarten I remember being able to smell the seasons change. To this day, I still walk outside on the first crisp fall morning and remember my old house and the scene of our freshly cleared garden.

As I got older, my brother Steven, I and our friends spent full days exploring the woods behind our house. To prevent getting lost we marked trees and other physical features to help us find our way back home. Occasionally we would cache old bones and other treasures our mom and dad were less than excited to stash in the house. It was these formative years where I developed my love for exploring nature and desire to share my experiences with others.

My early years also taught me about the importance of understanding my sense of place and location. Each winter my extended family would ski at a resort in Wisconsin for a week. Given the amount of time I spent on the trails, my parents felt comfortable letting my cousin and I ski by ourselves when I was only

in fourth grade. However one afternoon I was feeling quite adventurous and persuaded my cousin to take the longer five kilometer route instead of the two kilometer we had told our parents we were taking. Halfway through our journey, it started to get dark and I knew my parents would be getting worried. Although I had taken the route numerous times before with my parents, I felt scared when the sun fully set and I realized we were alone, far from the lodge. It was the first time I remember losing that comfortable sense of place. My cousin and I decided to continue on the trail. After what seemed like hours (but more likely 15min) we reached the lodge. After a huge sigh of relieve from both my parents and myself, I vowed to never get lost again. This experience opened my awareness the significance of having a good sense of location and geography.

Middle School

During the early part of my middle school years our family moved to a suburban setting with far less areas to investigate and a neighborhood very different from the one I had known before. My love for being outside flourished in new ways. Outdoor free time led to new adventures such as soccer, hockey, Nordic skiing and running. While I still valued my time outdoors, like most middle school students, my focus became more on the competitive nature of the activity rather than simple enjoyment. These new activities were unlike the freedom I knew as a kid exploring the outdoors; however, with the changes, I started to appreciate another way of spending my time outdoors. Looking back I

was fortunate to have adult role models that ignited a spark in me to continue learning about the natural world during these formative years.

One role model in particular was middle school science teacher Mr. Jacobson. During his class we were asked to create a leaf booklet containing 28 different leaves with detailed descriptions for each leaf. I'll never forget the hours I logged looking at the Minnesota tree guide or the fun times I spent outdoors with friends. Working on this project brought me back with my old neighborhood friends exploring the forests, collecting secret treasures and marking trails to find our way back home. Middle school reinforced the study and science and lead to the enjoyment of exploring nature I experienced in my early youth.

To this day Mr. Jacobson continues to amaze me. During my first year teaching an environmental education unit on Native American tools, I handed out an article about the art of canoeing. The article was written by none other than Mr. Jacobson. I was fortunate Mr. Jacobson was an expert and truly loved sharing his loved sharing the outdoors with us. Although I must admit most students, including myself, saw Mr. Jacobson as the corky, odd science teacher, his influence reached beyond the science room inspiring many to take a deeper look at the environment that surrounds them. His influence continues to be strong years after his retirement through his writings and work with outdoor education programs throughout the state.

Development and Life Saving Skills

The motivation for learning about the environment I developed in middle school using exploration skills I learned from early childhood, equipped me for bigger adventures. My new found confidence led me to successfully travel unique landscapes on multiple continents individually and as an adult group leader. My first solo adventure took place during the summer between my junior and senior year of college. A friend's dad was the superintendent of the Teton National park and offered me a job working at a restaurant in the park. For the first time since childhood I was surrounded by likeminded people willing to explore the vast wilderness before us. In our free time we hiked through the park and climbed many of its highest peaks. While I was in the Tetons I found myself in some dangerous situations. These new experiences reminded me of the times when I was young navigating the woods behind our house and the ski trails of northern Wisconsin. The old memories gave me confidence to stay calm and think clearly during potentially dangerous situations. It wasn't until I began my teaching career that I realized the extent to which my early experiences have guided and shaped me into the person I am today.

Teaching and Learning

I accepted a long term substitute position in my hometown of Hastings, Minnesota my first year teaching. I had some reservations taking the position given the fact I was a student there just four years prior. The opportunity ended up being a benefit because I could relate to the community; especially the kids on

a different level than most new teachers. I recall an unusual situation when I was shocked explaining a story of all the neighborhood kids getting most Friday nights during the summer to play a massive game of “Kick the Can”. After I finished the anecdote and related it to general military strategy, I vividly remember looking out on a sea of wildly confused ninth graders. To my surprise the students weren’t confused with the concept of guerrilla war tactics but completely clueless about what the game “Kick the Can” was. My next question then was, “Well, what do you do in the summers?” A variety of answers included shopping, playing video games, watching TV, reading, and playing sports. Looking back on it now, relating the concept to one of today’s most popular video games probably would have been more beneficial. I realized a big difference between me and this generation of students is their lack of time spent outside. To me, I was left feeling unfortunate for the kids when comparing to my own youth in the outdoors.

Another shocking comment was made by a very timid girl who raised her hand and said, “But Ms. Messick, weren’t you afraid you were going to get lost in the woods at night?” A very logical question and one I think many parents ponder before letting their children outside to play these days. Personally, throughout all of my experiences I can’t remember a time when the fear of getting lost inhibited me from going somewhere. Even after the night my cousin and I felt lost on the ski trail, I was back out the very next day exploring.

The students’ comments also prompted me to ask them questions about their experiences of being lost. Most students shared a time when they were afraid they would never get back home or find their loved ones. Some stories

were experiences in nature but most were stories of being separated from their parents in a mall or store for a brief time period. The student's stories got me thinking about the topic of *location* and how various childhood experiences, especially in the outdoors, can have an effect on a person's sense of location and place? From my own experiences I have come to understand that I was largely impacted by *location* and *place* and was able to keep a strong sense of this in the areas I traveled. In my study I want to see how the use of Global Positioning devices outdoors can help students develop a stronger sense of place and location.

Within the past decade, I have come to better comprehend the generation gap that existed between myself and my students. As a young teacher, twenty-three at the time, I felt I could relate more with the students than with my older colleagues on many topics given the age similarity. After having this discussion with my students I realized the different world students are growing up in today. Instead of playing Kick the Can they are playing virtual school yard games and text/IMing their neighbors instead of physically walking out the door to hang out with them.

Emotions continuously run through my head after thinking about the loss of outdoor learning and play. In many ways I felt sorry for the new generations, that some may never experience the excitement of making a break for the can, the safety I felt walking through my neighborhood at night or the confidence I had hiking through a national park. In a certain sense, these students probably feel excitement and safety as well; however more often its behind a computer screen. This realization helped me to understand this generation's need to feel connected

through technology. And as much as I am committed to sharing my “old school” ways with my students and helping them to feel more connected with nature, I needed to “get with the times” in order to reach students on their end. The trick was to find a way to try and incorporate both nature and technology so that students might also be able to find their own sense of place and location in a growing technology driven world.

The idea of incorporating GPS technology into my classroom intrigued me from the moment I used my first GPS unit. My parents bought me a sports training Garmin to help me in planning running and hiking routes in the various places I traveled. As I learned more about the capabilities these units possessed I thought about different ways I could incorporate them into my classes. Not only can learning about GPS technology be an effective and experiential way to learn basic geographical concepts such as absolute and relative location, but they also get students outside learning place and location in their own local environment.

Like Mr. Jacobson, I want to provide students with the opportunities to learn more about the geography of their own community, as well as providing outdoor experiential learning. With Mr. Jacobson in mind, I applied and received an Earthwatch fellowship in Nova Scotia, Canada to conduct research. During my two week stay I worked with a research team from Oxford University studying local mammals and the effects climate change was having on them. I also broadcasted videos and examples of our work to my students. Certain days I reported what I was learning and the process for collecting the information from our research site. This field experience allowed me to see first hand how ordinary

citizens can learn and be a part of a research assignment positively impacting our planet. This opportunity gave me confidence towards implementing my ideas back into my school.

Along with the fellowship experience, I received a small grant to start an environmental education program at my community and school. One of the major goals of our district has been to integrate technology into our lessons to prepare young minds towards being successful in our changing world. In my research, I found that some schools successfully use Global Positioning Systems (GPS) technology to foster a deeper understanding of basic geography, science and math skills. I was excited about the opportunity to use GPS not only because of its benefits in enhancing lessons, but also because our school has access to a forty acre forest land area across the street where GPS courses could easily be set up and explored. Ecstatic about the opportunities, I used the grant money to purchase a couple of GPS units for the school.

This summer I gained much needed knowledge about GPS and orienteering working as an instructor at an environmental education center in the Appalachian Mountains of West Virginia. This experience motivated me to look at different ways environmental education can become part of my school curriculum. It also opened my eyes to the importance of creating meaningful lessons that not only teach a subject but also a valuable skill.

In completing this study I hope to not only provide information on how better to teach basic geographical themes, but also how to provide effective outdoor learning experiences for students. I have found positive responses in my

eighth grade elective environmental education class where I have started to incorporate GPS technology. I am excited to bring the technology to my seventh grade geography course in hopes that the method will help students gain a deeper understanding of the core middle school geography standards.

Along with meeting the Minnesota State Standards, I want to strengthen the human relationship to the natural environment. I anticipate that students will develop a strong sense of place through time spent in the Big Woods, a forty acre area of an old growth Maple/Basswood forest. Finally, I want students to develop a sense of location and knowledge of basic navigation skills that will give them confidence to explore and travel throughout the world.

CHAPTER TWO: LITERATURE REVIEW

The goal of this research study is to take a deeper look at incorporating the Global Positioning System in geography classes and how use of this technology can foster a better understand of geographical themes, spatial literacy and enjoyment in learning basic geographical skills in today's middle school geography students.

In order to understand the spectrum of this topic further research and discussion about the using of GPS in modern day educational intuitions will be looked at in this chapter.

Defining the Terms

In order to fully comprehend the research topic it is important to understand the terms used throughout the study. According to The American Heritage Dictionary of the English Language, technology is "The body of knowledge available to a society that is of use in the fashioning implements, practicing manual arts and skills, and extracting or collecting materials." This definition will be used when referring to technology, advanced technology or cutting edge technology. The primary example of technology in my study will include Global Positioning Systems, or more commonly known as GPS.

Merriam-Webster Dictionary Online defines GPS as "a navigational system using satellite signals to fix the location of a radio receiver on or above the earth's

surface.” The US Department of Defense initiated the Global Positioning System in April of 1973. It is made up of an intricate system of 27 satellites (24 active) that orbit the earth, five ground control centers located throughout the world and individual GPS receivers that can be located anywhere on earth. The US Defense Department developed this system for military purposes and to keep an accurate log of their enemy locations and their own war craft during the Cold War (Wikle, 2000).

During the Clinton Administration, GPS receivers and signals were able to be purchased and used by civilians for a variety of activities. Over the past three years the most common use of GPS technology has been in the field of personal navigation. Most new cars have an internal GPS receiver that gives accurate step-by-step directions to any location with a ten foot margin of error. Other receivers are used by sport outdoorsmen and women to give the best hunting and fishing times and locations. Runners and bikers have also benefited from GPS in being able to create schedules, maps, log distances, times, monitor heart rates and even calculate calories burned during a workout. The other area where GPS technology has seen a large increase throughout the past nine years is in recreation, particularly through the activity of geocaching.

Geocaching is the recreational sport of finding and hiding mini-treasures using specific geographical coordinates of latitude and longitude (Groundspeak, 2009). Geocaching developed after David Ulmer, an engineer, hid bucket full of little trinkets and a log book near his home in Portland, OR. He then posted the coordinates on the internet and challenged people to find it. Some groups found

the cache within days. Ulmer originally called the sport *The Great American GPS Stash Hunt* but because of the negative connotations relating to ‘stash’ it was renamed geocaching. Today there are 734,095 caches hidden in over 200 countries throughout the world (Groundspeak, 2009) with more added each day.

Geographical Terms

Other terms of my study include geographic vocabulary specifically relating to the themes of geographic study including location, place, human-environment interaction, movement and region. According to Tim Cresswell (2008), in 1984 the Joint Committee on Geographic Education came out with the *Guidelines for Geographic Education* stating these five themes were to be the fundamental themes of study for K-12 geography students in the United States. These guidelines were widely adopted by many states throughout the country, including Minnesota, as the basis for geographical studies. In order to fully understand my objectives and integration technology in my geography class it is important to define each term.

David Hill (1989) lays out these themes according to the *Guidelines for Geographic Education*. The most commonly thought of theme in geography is location. According to Hill, location refers to the position of a place on the earth’s surface. Location can include two elements; absolute and relative. Absolute location refers to the exact location defined by the mathematical coordinates of latitude and longitude. Relative location defines a place and its relation to other places generally using directional the language of north of, south

of, east of or west of. In my study I will look at how using GPS units affects students knowledge of location and specifically relating their personal knowledge of their location.

Place is the second theme taught in geographical studies. Place looks to describe the human and physical characteristics of an area. It answers the question *What's it like?* While place can be a broad theme, it is important that students be able to describe the people, traditions and culture as well as the physical landscape and resources that make a place unique or locations with meaning. (Cresswell, 2008) Students in this study will describe the place of the Big Woods, a woodland area across the street from our school. Cresswell defines a sense of place as “the meanings, both individual and shared that are associated with a place” (p. 134). Through the use of GPS technology, students will spend a considerable amount of time in the Big Woods and develop a personal connection with the environment that will help them understand their place within their local environment.

The third theme defined in *Guidelines'*(2008) is human-environment interaction (HEI). HEI looks at the relationship between the physical and human characteristics of place and determines how they interact with each other. It asks the questions, “How do people affect and change the environment?” and “How does the environment affect and change people?” Using the GPS units, students will study the location of the Big Woods and make observations about their personal interactions with the environment.

The fourth of the five major geographical themes is movement. Cresswell (2008) explains movement as the relationship between places. Movement also explores how ideas, goods and people are able to move around in specific places and between different locations. According to Backler and Stoltman (1986) movement is also “most visible evidences of global interdependence and the interaction of places are transportation and communication networks linking every part of the world.” (p. 1). Students will again look at movement in the Big Woods and St. Michael/Albertville area as well as explore the relationship between their home city and other parts of the world.

The final theme outlined in *Guidelines (2008)* is region. Region is usually taught last in geography curriculum because it looks at the other four themes to draw comparisons between different places. As Hill explains, “Geographers create regions to help make sense out of the great physical and human diversity on the earth’s surface” (1989, p. 3). While region can be the most challenging theme for middle school students to grasp, the use of GPS while studying their local area will provide students with the experience for recognizing regions within their communities and throughout the world.

These five main geographical themes are common throughout current middle level geography curriculums in the United States. However, there is continued debate among professional geographers as to the importance of thematic geography verses functional geography, or the type of geography that focuses on the location of cities, towns and physical features. An interesting study by Claire Brooks (2006) at the Institute of Education in London, England

looks at this particular question by completing a study using two ‘expert’, or recommended by the Geography Education Community in Wales, geography teachers. Brooks observed and interviewed each teacher to make her conclusions.

The first case teacher Brooks looked at stressed the importance of place and experience as being one of the most important tools for successfully teaching geography. While he follows the National Curriculum standards rather closely, focusing on locations of places, he also likes to bring in his personal travels and experiences in order to encourage students to want to explore the places they are learning about for themselves. However, he sees the importance of understanding place and location:

I just honestly believed that if they have some sense of place, they will be good citizens and they will understand where they are in the world, because the lack of sense of places grieves me sometimes because they go off to a place, and I say “Oh the Canary islands, that’s just off Africa’ and they’ll shout at me: ‘no it isn’t – it’s in Spain’. So I’ll get the Atlas out, ‘here’s Africa. Here’s Morocco’ and we go all around – the ignorance about place is so amazing. (Study Teacher #1, 2006, p. 360).

While the study of place is one of the five fundamental themes taught in the United States national and Minnesota State standards, the teacher in case study number one places more emphasis on students in the middle level learning place above the rest of the fundamental themes (Brooks, 2006).

Brooks concludes that case study number one “struggles between using a quantitative approach to physical geography, focusing on the measurement and a more humanistic approach based on experience” (2006, p. 361). I can relate to case study number one in my own teaching philosophy. It is vital for students to understand both their personal place in the world. It is also imperative that they gain the ability to identify locations of different places throughout the world. A great motivation tool for this relationship is through personal experience or the individual exploration using GPS technology.

Case study number two on the other hand takes a more humanistic approach to teaching geography. He emphasizes the importance of students being able to see different sides of the same story or looking at a place from multiple perspectives. Case study number two explains his personal interest in the geography field:

Well my main interest is in fieldwork and for the academic side of things I am very interested in the qualitative ways of doing fieldwork and I supposed it is drawing on the cultural geography interest and background but taking it into the fieldwork area finding different ways of doing things and looking at the world in a different way (Brooks, 2006, p. 363).

Case study number two uses his personal interest in field work and discovering multiple view points to lead students toward self-development and understanding geography.

I think it is important to know about the world they live in. Very often I find that I am teaching something and I think, I'm glad they are learning this, I am glad that they are becoming aware of this and I think it is important. Like for example trade, and why some countries are rich and some are poor, and that is a very useful role (Brooks, 2006, p. 365).

Case study number two primarily focuses on the humanistic geography and making connections rather than using a fundamental approach to the study of geography. Brooks (2006) concludes that case study number one chose to focus more on meeting the national standards through the study of place while case study number two emphasis geographical issues and the thinking process used to interpret information.

Although case study teacher number one focuses his teaching on the theme of place and case study teacher number two focuses his teaching on the cultural history and current events that occur in the places they study, using themes of place, movement and region; neither emphasizes the importance of tying all five fundamental themes, outlined in *Guidelines* (2008), together to give students a broader approach to studying geography.

An earlier report on teaching the five fundamental themes of geography titled *The Nature of Geographic Literacy* written by Alan Backler and Joseph Stoltman (1986) explained that the need for teaching the five fundamental themes is vital to geographic literacy. "Knowing where things are is only the first step in

attaining geographic literacy. Ultimately, geography is concerned with understanding why things are located where they are. To answer this type of question requires the use of a wide range of geographic themes, concepts and skills.” (1986, p. 1)

Sense of Place and Location

The use of GPS technology in studying these five themes will give students a basis for studying their personal area. Once a solid knowledge base of the five fundamental themes is set, students will be able to incorporate the five themes to develop a deeper understanding of other parts of the world. As Hill (1989) puts it “Geography is not mere place, names – capitals, countries, and rivers – but rather the whole science of the significance of location” (p. 2). The idea of creating this sense of place and location is an important goal for me in teaching geography. While many students are able to rattle off the locations of countries and capitals, it my goal for students to develop empathy and understanding for the people and places we study because geography is not only the knowledge of location, but an understanding of how location, place, human environment interaction, movement and region affect the people, governments and culture of different places around the world.

For students to develop empathy, it is important for them to have a deep understanding of their local place. Naturalist Robert Michael Pyle states in Richard Louv’s (2008) bestselling book *Last Child in the Woods*, “Place is what takes me out of myself, out of the limited scope of human activity, but this is not

misanthropic. A sense of place is a way of embracing humanity among all of its neighbors. It is an entry into the larger world.” (p. 68). Recently more has been written about the idea of finding a sense of place, “A sense of place is a way of saying that this place is different and special.” (Cresswell, 1989, p. 2). In identifying their personal place, they will develop a deeper understand of their communities and be able to make comparisons between their place and other places around world. In looking at the similarities and differences between places they will also develop a deeper appreciation and respect for the variety of place.

However, with the growing dependence on technology within our schools and homes, students are growing up in a different world where their sense of place may no longer be defined by their neighborhood or hometown, but by their *place* in the virtual world; who their friends are on My Space or Face Book. This is concerning to me given the fact that most students will need to eventually grow up, work and interact in a tangible world. Therefore it is important to provide opportunities for them to connect and find a sense of place in the *real world*. By tapping into their technology motivation through the use of GPS, I can introduce them to places in their community they might never have explored otherwise, in turn, provide opportunities to develop a sense of place in the tangible world.

Spatial Literacy

By teaching the five fundamental themes of geography I am providing students the opportunity to develop a sense of place. In addition, my students will also have the opportunity to become spatially literate through the use of GPS

technology. With the advancement of technology and the knowledge of far off places at their finger tips, geography has become less about memorizing countries and capitals and more about the study of how we relate to each other and the environment. Geography curriculum now teaches students how to think spatially as well as connect students to the topic studied so they can become one (Sternberg, 2004). According to Malcolm McInerney (2009), US educators define spatial literacy as, “the knowledge, skills and habits of mind to use concepts of space, tools of representation, and processes of reasoning to structure problems, find answers, and express solutions to these problems.” (p. 1) While the majority of spatial literacy is expected to be taught in geography, spatial knowledge is vital in more disciplines including dance, music, painting, sculpture, genetics, biology, physics, planning architecture, design, neuroscience, psychology and linguistics (Golledge, Marsh and Battersby, p. 1).

Richard Louv (2008) discusses the idea that many children are growing up without basic environmental knowledge gained through experience being in the outdoors including spatial literacy. He discusses the idea of childhood tree house construction and the valuable skills that are learned from completing the simple task of nailing a couple of boards together. Some of the many skills children can learn are, “how the size of your body relates to the world: your arms and legs to the diameter of the tree trunk; your height to the tree height; your legs to the spacing of the ladder turns; your reach to the spacing of the tree branches; your girth to the size of the trap door; the height from which you could safely jump, etc.” (p. 82).

Using the GPS units, students in this study will have the opportunity to practice and develop their geospatial skills by simply spending time in the woods. In doing so, they will learn how the space relates to them and the rest of their community. “Much of our learning comes from doing, from making, from feeling with our hands; and though many would like to believe otherwise, the world is not entirely available from a keyboard.” (Louv, p. 93). This study may provide them with an interactive way to learn; where the student not only gains vital knowledge but also create a memorable experience.

Benefits for Students

John Morgan, a British Geographer, shares Louv’s way of thinking as he explores the idea of creating meaningful geography curriculum and closing the gap between secondary and college curriculum in his essay *Curriculum Development in ‘New Times.’* Morgan (2008) explores how geographical education has changed over the past three decades. He also gives advice on how to look at curriculum in the face of a new era. He suggests three main ways of doing so:

The first assumes that children need to know what the academic disciplines teach, because that gives access to a general culture and to the most developed account of the wider world. This argument underpinned the development of the national curriculum, which was seen as offering a similar entitlement for all. The problem is that attempts to get most

children to 'but into' academic knowledge create difficulties. The second approach is to develop knowledge that is designed to prepare students for the 'world of work'. The problem here is that this vocational knowledge tends to have lower status. A third way of thinking about the relationship between pupils and school knowledge is that pupils should have access to formal knowledge via learning which begins with their own experience and the forces that shape it, but does not stop there. (Morgan, 2008 p. 22)

Looking at Morgan's (2008) beliefs, there is much value in providing students with education and experiences that prepares them for the future by incorporating technology they will use in the near future. "Real world" experiences prove to help students retain and understand information. Mentioned in Louv's *Last Child in the Woods* (2008), John Dewey, an educator from the early 1900's, discusses the importance of getting kids outside of the school to practice vital "real world" learning. "Experience has its geographical aspect, its artistic and its literary, its scientific and its historical sides. All studies arise from aspects of the one earth and the one life lived upon it." (Louv, p. 201) Providing experiential education where students learn by doing it vital to a successful education. "In addition to classroom practice, 'playground practice' is in order." (Ekiss, Trapido-Lurie, Phillips, Hinde, 2007, p. 7) As our world continues to change through technology, it will be increasingly vital for students to learn the skills vital to be successful in the future, while still providing for effective experiences that also connect students to natural places.

Criticisms

While recent studies tend to show a correlation between increased media use and ADHD and nature's effect on children with ADHD symptoms, the main criticism for these studies is the lack of scientific evidence a relationship exists in both theories. More studies clearly need to be done. Skeptics also feel the evidence presented in studies done on both topics was collected subjectively with little hard evidence to support their claim.

Louv is also criticized for similar claims. Pete Cleary picks apart Louv in *Last Author in the Nostalgic Past: Curing 'Back-in-MyDay' Disorder*. He accuses Louv of not looking back far enough in history to paint a full picture of human's relationship with the environment. "The last child in the woods is preceded by the last generation of parents in the woods who are preceded by the last generations of grandparents in the woods" (Worrell, 2009, p. 2). This suggests that Louv needs to look at the progression of man's disconnect with nature in all recent generations, not just the current ones.

Worrell (2009) agrees with Cleary on this argument:

Instead of examining a longer span of history, Louv is forced by his frontier construct to concentrate his energies on just a few generations.

One of these generations is his own. Louv's analysis of the relationships between baby boomers and nature reveals his less-than-objective

perspective, and opens *Last Child in the Woods* to criticisms, legitimate or not. (p. 2)

In order to get an accurate depiction of how man's relationship with the environment has changed over time, it is imperative to look at numerous generations and important events, technology and cultural traits that occurred during those generations.

Challenges to Incorporation

While many readers and reviewers of both Louv and Morgan agree with the idea that students today need to experience more hands-on, outdoor learning, there are numerous societal factors and political viewpoints that contradict these beliefs.

Chief among the opposition is the issue of educational funding. As the economic recession continues to affect more sectors, funding for outdoor-experiential learning becomes an uncommon luxury rather than an everyday occurrence. Many schools are having problems finding enough desks to accommodate their increasingly overcrowded and understaffed schools. The worry for many schools is not whether or not they have enough GPS units to accommodate more students, but if they will have money to hire enough teachers to fulfill the growing need for special education and English Language Learner programs.

Furthermore, with the declining funding, school districts are to put more money and class time on improving standardized test scores. In 2008, Minnesota launched the first MCA standard science test covering material learned from a student's sixth grade through eighth grade years. Time that could be spent developing outdoor curriculum is now spent reviewing information learned over the past three years for most teachers. Among the reading, writing, math and science standardized test, the social studies test is currently being written.

While this capstone hopes to prove that teaching standards in an outdoor setting can be done effectively, learning and incorporating new teaching strategies takes time, something most teachers struggle to find throughout their busy days. Many teachers are hesitant to learn yet another *new technology*. However, it is vital for teachers to stay connected with the way students learn and what they are going to need to know in the future. If kids are using a lot of time, thought and energy learning these new technology skills then why are teachers so afraid of it or reluctant to put it in our curriculum? (Scott, 1990)

Looking at the typical day for a teacher: taking attendance, answering emails, grading assignments, dealing with individual student behaviors, implementing the newest teaching strategy required by the district, planning the lessons for that day, making sure all materials are present, updating webpages and grades, connecting with parents and finally teaching the lesson, teacher's schedules don't always provide for time to learn and implement a new technology. Scott also gives three other reasons for the barriers to intergrading new technologies:

1) Lack of quality professional development for teachers; 2) a lack of time to explore, apply, and reflect with colleagues on challenges and potentials of integrating any type of technology into the classroom culture; and 3) limited administrative support about how to use technology effectively to empower learners. (1990, p. 35).

While these barriers are real and, in many cases hard to overcome, it is imperative that teachers start to recognize the difference in learning styles that change with different generations. Peggy Sheehy, cited in Scott's article explains "Compared to us, I believe their brains have developed differently. If we teach them the way we were taught, we're not serving them well" (Scott, 1990, p. 34). It is important for teachers to understand the changes that have taken place that affect the way our students think and learn and try to stay up-to-date on the latest technology. However, it is also important to remember that while the technology boom has been beneficial to society there are draw backs to creating a generation completely dependent on modern day technology.

Looking at the research available relating to students technology use and the benefits of outdoor learning, there seems there are two conflicting arguments. The first argument is the idea that students need to be exposed to and learn about the latest technology in order to be successful members of society and we, as teachers need to foster that understanding. Groundbreaking studies such as *Generation M: Media in the lives of 8-18 Year-Olds (2005)* report that the youth

today are spending on average of 6.5 hours a day outside of school using media technology (computers, internet, video games, music and television). Given these statistics, it is imperative that teachers also use technology to reach students and help connect them to the curriculum on their level.

The second, argument supported by Louv (2008), Kirkorian, Watella and Anderson (2008), is that children are being exposed to too much technology at too young of age and need to spend more time learning from and in nature. In these changing times both proved to be valid arguments, which is why my goal in this study is to look at incorporating learning with and about modern technology, Global Position System, while using the outdoors as my classroom to increase spatial literacy and knowledge of the five fundamental themes of geography.

The idea of compromising and incorporating lessons that maximizes student learning of geographical concepts, technology while providing time for students to be outdoors experiencing nature seems a highly beneficial way to develop well-rounded, successful students; but it also proves to be a daunting task for many reasons. As experienced by almost every teacher and described above by Scott (1990), teachers face strong barriers trying to incorporate new activities and technologies into curriculum given that fact that educational standards are increasing, money available is decreasing, time for completing everyday tasks as well as fitting all of the curriculum standards is scarce.

Scarcity of money to buy GPS units for classes proves to be a challenge. While our school was able to purchase six units through grant money, 7th graders would benefit more by having at least one unit per group of two or three and not

one per every four or five students. Class size for both classes studied is twenty seven students to one teacher which presents a potential problem when having to supervise all students completing the activities in the Big Woods.

Meyer, Butterick, Olkin and Zack (1999) from the University of Connecticut also caution teachers incorporating Global Information System (GIS) into their classroom curriculum of some common oversights through the implementation. (GIS is similar to GPS, however it is a more advanced system that is used to create accurate maps using the same satellite system as GPS). The first argument warns teachers that while learning how to use GIS is important, making curricular connections should be the goal (Meyer, Butterick, Olkin, Zack, 1999). Teachers need to have clear objectives and not stray from them while using the technology. If they do that, the technology becomes more of a distraction than a learning tool. The other cautions stress the importance of teachers being an expert in knowing the ins and outs of GIS. In order to provide students with an effective learning environment, teachers need to take the time to educate themselves not only on how to use GIS, but also on how to effectively communicate their knowledge to students.

In terms of completing my study and this chapter in particular, one of my biggest challenges is the lack of previous study on this topic. Thomas Baker (2001), author of *Success with GPS* relates to my struggle, “Although GPS receivers can open doors to environmental and biology-based research studies for the classroom, their inclusion into school curricula is not well documented.”

(2001 p. 40) Despite the absence of formal studies, there is evidence that points to teachers beginning to use GPS technology in their classrooms.

During the research process, a number of magazine articles reported the success of GPS for teachers throughout the United States. Anna Adam and Helen Mowers discuss using GPS to create scavenger hunts that highlight various historical markers in their local area in their article, *Can You Dig It?* (Adam, Mowers, 2007). Students completed a high-tech scavenger hunt to introduce students to the various historical landmarks in their community. Once students found the particular locations using GPS technology they learned more about the particular historical site and completed activities relating to the specific landmark. Activities such as this prove that GPS technology can be successfully incorporated in various subjects apart from Geography.

Other classroom teachers who have found success with the incorporation of GPS have posted their materials in Journals and online including Linda Joseph (2006). Joseph provides an updated set of websites for teachers wanting to incorporate GPS technology into their classrooms along with national and Ohio educational standards met through the use of GPS technology in *Caching in on GPS*. This article proves to be very beneficial as it connects GPS technology with the primary role of the teacher, to teach students according to the state requirements.

Thomas Baker (2001) states in his article *Success with GPS*, “A GPS receiver can be a powerful ally when engaging students in problem-solving events” (p. 39). He goes on to give ideas for the incorporation of GPS in the

science, math, and social studies disciplines. While the presence of GPS is prevalent in our world today, I'm looking forward to studying the effects of this technology on geography students.

The use of GPS technology in the classroom is an exciting opportunity. Students will gain the knowledge and skills to use GPS in the future. There are currently over 837,554 geocaches in the world (Groundspeak, 2009) meaning there are over that many people currently using this technology. Providing students with the skills to work with GPS will prepare them to work with cutting edge technology in the future.

This experience will also provide students with the opportunity to learn in the outdoors. In doing so, it will help them to develop a personal connection with the environment and their surrounds which could lead to a greater understanding of geography and ultimately the world around them.

CHAPTER THREE: METHODOLOGY

Study Overview

This study will be conducted to look at the effects of using GPS technology in social studies curriculum has on student learning of the five basic geographical themes, spatial literacy, and student enjoyment of geography lessons. A heterogenic group of 54 seventh grade students will complete two activities using GPS technology in class. Qualitative and quantitative data will be used to collect data for this study and will include student surveys, results from activity worksheets as well as teacher observations.

Groups of students contain a variety of ethnic backgrounds, learning abilities and styles. Of the 54 students who will complete the activity, there will be 29 female students and 25 male students. The racial diversity will include 46 White (non-Hispanic origin) students, two Black (non-Hispanic origin) students, two Hispanic students and four Asian/Pacific Islander students. Five students are identifies as limited English speakers.

The two activities used in this study will be completed during three class periods of 52 minutes each. Lesson one will be completed during one 52 minute class period and consisted of the pre-survey, background of GPS, instructions on how to use GPS receivers and a lesson on how to find their first official geocache. For lesson two, special class period arrangements will be made in order to provide students two full class periods or 104 minutes to complete the activity in the Big Woods. Lesson two will consist of a review of the five themes of geography

(taught in the beginning of the year), introduction to the activity, the activity itself and the post survey.

Terms of the Study

Group One: refers to the students who are in my fourth period geography class.

Group Two: refers to the students who are in my fifth period geography class.

SMART Technology SENTEO Units: Technology used to gather student survey information. They are individual hand held remotes where students are able to input their information via the remotes. The information is compiled and sent to the teacher computer in the form of Microsoft Excel.

Preparations

Numerous preparations were made in order to complete both activities. Below is a list of the preparations I completed before lesson one.

1. Create permission slip to use the Big Woods as well as information about my study for parents/guardians to sign before study takes place.
2. Import the official geocache coordinates of the *Wind Tree* geocache to each of the six GPS receivers.
3. Divide class into groups of four to five students.

4. Remind students the day before lesson one to bring appropriate clothing to go outside.
5. Create intro to geocaching PowerPoint.
6. Obtain walkie-talkies from main office to use in case of emergency.
7. Pick up health supplies from nurse.

Below is a list of preparations done before lesson two.

1. Check with administration and math teacher to have permission to have one group of students for two hours of the day one day and two hours with the second group of students the following day in order to complete lesson two.
2. Make a blank worksheet for students to fill out as they are completing the activity.
3. Find enough clipboards for each student.
4. Make a cheat sheet for each group on how to use the GPS units.
5. Find five empty tennis ball or other containers to serve as the caches.
6. Scout out five areas to place the caches that relate to each of the 5 themes:
 - a. Place: At the area just entering the Big Woods)
 - i. Cache says: Take a slow 360 degree turn around you. In 2 to 3 sentences describe the Place of this area in terms of the physical and human characteristics
 - b. Location: Near the swamp

- i. Cache says: Looking at your GPS unit write down the Absolute location of this spot. (Mark a waypoint and then write down what this spot is on your sheet.
 - ii. Describe the relative location of this spot (using the compass page write down what it is north of, south of, east of and west of)
 - c. Human Environment Interaction: Near the large Basswood tree that fell in a storm.
 - i. Cache says: Take a look at the area around you and what you have seen so far today walking here. Describe 1-2 way humans have changed the environment and 1-2 ways the environment has changed the people that live in this area or even you right now.
 - d. Movement: On the corner of the street close to the place cache
 - i. Cache says: Looking at the area around you how are ways people, goods and ideas are exchanged around you. Name at least one way for each topic.
 - e. Region: Near the school by the tennis courts
 - i. Cache says: Now that we have seen the area of the Big Woods and its surroundings what are some characteristics that you think are similar of other places. Come up with one region to fit the Big Woods and surrounding area into a region and describe 3 detailed reasons why you placed it in

the region you did. (Hint, look at what you wrote for the other themes, are there anything this place shares in common with other places you have been?)

- f. Add one final question about how far students traveled in the Big Woods, when students get back to the school they will look at the trip manager on the GPS to find out and write it down.

7. Prepare the caches: for each cache print out a 1/3 sheet that has the questions on it, 1 per each group so they can each see the questions.
8. Prepare a teacher sheet to log on which team found the cache first and make other observations.
9. Go out the morning of/afternoon before and hide each of the caches and mark them on the GPS units along with a name that represents each of the themes.
10. Divide the students into six groups (4-5 students in each group).
11. Watch the weather for the best 3 days at the end of March to complete the activity.
12. Prepare post survey for students to answer when they are finished the activities.

Numerous preparations needed to be done in order for both activities to take place. Many of the preparations included the permissions slips, schedule changes and preparing the caches were completed weeks before the lessons were preformed, however; the cold and rainy weather played a significant role in postponing lesson two until adequate and safe weather presented itself.

Procedures

Below is a list of procedures that were taken during lesson one.

Lesson One

1. Give students the pre-survey. Tell them to do the best they can and answer the questions as honestly as possible.
2. Review with students the background on GPS and the guidelines for using the Big Woods and GPS receivers.
3. Give students their groups and have students come up with a group name.
4. Explain that they will have an opportunity to practice their detective and technology skills by finding one of the official geocaches hidden in the big woods.
5. Show students the geocache (wind tree) on the official geocaching website and explain that I have already loaded the coordinates on to their GPS units then their job is to find the cache.
6. Have one member from their group get a GPS receiver and a second member pick up the instruction sheet.

7. Then have students go outside and follow the directions on the sheet to turn on the unit and find the Wind Tree geocache.
8. Explain that we are going to walk as a class to the Big Woods and once they are there they will have the opportunity to find the cache.
9. Once students have crossed the street and are in the Big Woods give them the name of the geocache loaded into their GPS receiver and have students find the cache in their groups.
10. Once students have found the cache take it and show all students what is in a typical cache. Have groups log their information to the log sheet and then walk back to the school as a class.

Below is a list of procedures that were taken during lesson two.

Lesson Two

1. Students in group one or in my fourth hour class should report to my room at the normal time with their cloths to spend the afternoon outside.
2. Review the information with students about the GPS units as well as the information on the five themes of geography that we learned about in the beginning of the year.
3. Review with students the guidelines for using the Big Woods and GPS receivers
4. Have students get into their same groups, hand out the worksheet. Give students two minutes to read through the directions and pick student roles.

5. Explain that this activity will be both a competition on speed as well as the quality of answers. The competition will be the team to find the cache first will get an extra bonus point on the assignment. And the team with the best quality of answers will win the competition as a whole.
6. Hand out clipboards and student sheets.
7. Remind students that those students are to always walk with the GPS receiver and have two points of contact. Also the competition doesn't start until was cross the street.
8. When they hear the specific sound that means they need to stop what they are doing and head toward the sound.
9. When students are outside, have them get together with their groups and turn on the receivers once we're all outside.
10. When we have crossed the street, tell students to go to the *main menu* and *find* then to the page *waypoint*. Tell students the first cache they are going to find will be the place cache. Go!
11. When students have found it, sound the alert and go through the question with them. Explain that their answers need to be detailed. Give time for them to meet in their groups and discuss the answers.
12. When students have finished have the person who found it put it back exactly where it was. Then have students use their GPS to locate the next geocache which is Location and repeat step 11.
13. Next is Human Environment Interaction cache.
14. Then the Movement cache.

15. Finally the Region cache.
16. When students are finished answering the questions for Region make sure that they are on map page and head back to the main doors of the school.
17. When we get there have students take a guess as to how far they walked during the activity. When students have made their guesses have them check the compass page for the accurate number.
18. Then have students turn off their GPS units and head back to the classroom.
19. Collect the clipboards and the student question sheets and explain that I will come up with a winner tomorrow.
20. Once the worksheets have been collected hand out the post survey and give students time to complete it.
21. When finished, students may work on any homework for the remainder of the class period.

Day Three

1. Repeat the same steps as Day two but with group two students.

Limitations

Given the nature of the study there are numerous limitations involved. The first among the limitations is the issue of supervision. Group number one consists of 27 students while group number two consists of 29 students. It is hard for me, the only adult supervisor, to keep track of all students at all times within a 40 acre property during the activities. This is why I decided to design the activity

so that every group was searching for the same cache at the same time. In setting up my activity this way, fewer students will be able to experience actually finding the cache themselves; however it gives me the ability to supervise all students and know where they were at all times. The site of the activities is also surrounded on two sides by busy roads as well as a busy road that students will have to cross before getting to the Big Woods.

The weather will also play a significant role in the study. While geocaching can be done in all types of weather, I want to pick a day where the weather is warm enough so students who may not be able to afford warm jackets will be comfortable spending over 60 minutes in the outdoors. I want to also pick a day that is clear of clouds so the GPS receivers will be able to give a more accurate location reading.

Another limitation to consider is any health risks completing this activity posed on students. In order to be proactive in preventing health risks I will speak with the school nurse and obtained epipens for students who have allergies and/or inhalers for students with asthma. I also will make it a point to stay near to students with these limitations. I will also carry a walkie-talkie that connects to the main office and health office to use in case of an emergency. The issue of allergies also forced me to complete the activity during the time frame of early spring to avoid the potential risks associated with seasonal allergies or the prevalence of irritating plants such as stinging nettle and poison ivy.

The final limitation centers around the number of GPS units available for student use. Our school has a total of six GPS units. While this number is

sufficient for the completion of the activity, it is not ideal. Groups will range from four to five students with two students operating the GPS units throughout lesson one and two. Despite the importance of the roles each student played during the activities, I feel that smaller groups would be more beneficial for each student to have the opportunity to operate the GPS unit.

(Please see Appendix C for survey questions).

CHAPTER FOUR:

RESULTS

The results of my study consists of a three of subjective surveys given to students before starting to learn about and working with GPS units and after their completion of the five themes of geography GPS activity. Survey questions were opinion based and asked students to rate their knowledge of the five themes of geography and to rank their personal feelings about using GPS units in class, learning in the outdoors, as well as personal habits regarding technology and free time. Students were asked the same set of 17 questions before and after completing the GPS activities. An additional survey was given after completion of the activities as well.

Survey Result Notes:

- Numbers inside graphs represent the number of students who answered in that category out of a total of 54 students. Written results are presented in both numerical and percentage form.
- Percentages are also rounded to the nearest whole number.
- Pre-Survey indicates the set of questions students answered before working with the GPS units
- Post-Survey indicated the set of questions students answered after completion of the GPS activities.

Pre and Post Survey Rating Scale

1 = Not at all

2 = Not very well or very much

3= Somewhat

4 = Very well or Very Much

Question 1: On a scale from 1-4 how well can you identify the absolute location of a place?

Figure 1: Question 1 Pre-Survey

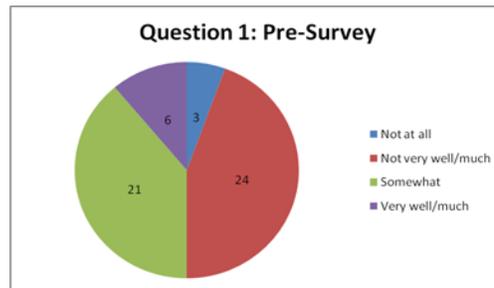
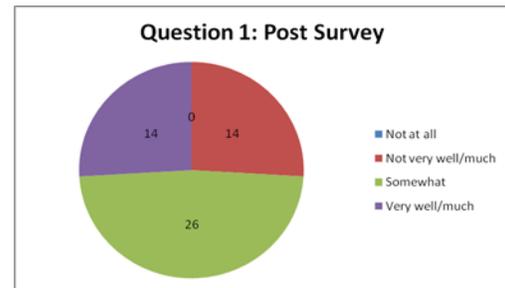


Figure 2: Question 1 Post-Survey



Result Summary

As we see from the results shown in *Figure 1*, before using the GPS devices 50 percent of the students were somewhat to very comfortable with identifying absolute location while the other 50 percent of students were marginally or not comfortable with the information.

Figure 2 shows zero students felt not at all knowledgeable while the number of students who felt only marginally comfortable decreased from 44 percent to 28 percent. The number of students who felt very comfortable with identifying absolute location rose from 21 percent to 26 percent.

Question 2: On a scale from 1-4 how well can you describe the relative location of a place?

Figure 3: Question 2 Pre-Survey

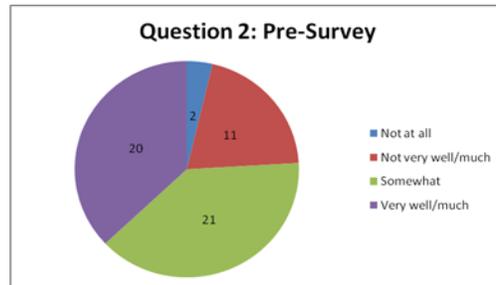
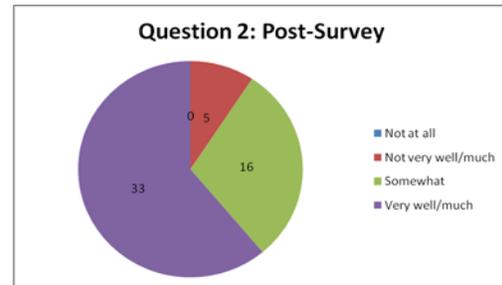


Figure 4: Question 2 Post-Survey



Result Summary

Figure 3 shows before completing the GPS activities, students generally felt comfortable with using relative location. Surveys reported 39 percent of students felt somewhat comfortable and 37 percent felt very comfortable working with relative location. Twenty percent of students felt marginally comfortable and four percent of students had zero confidence describing the relative location of a place.

Figure 4 shows after the activities zero students who had no confidence describing the relative location and five students or 14 percent who didn't feel very comfortable describing relative location. The number of students who were very confident describing relative location rose from 20 students to 33 students or 24 percent after working with the GPS units.

Question 3: On a scale from 1-4 how comfortable are you in describing the human characteristics of a place (in other words, what are the people like)?

Figure 5: Question 3 Pre-Survey

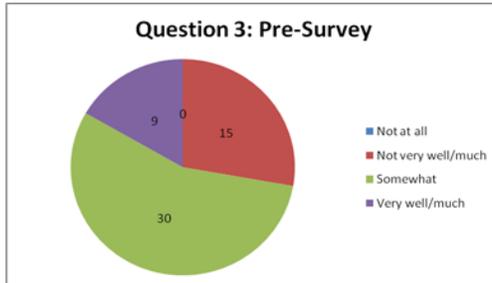
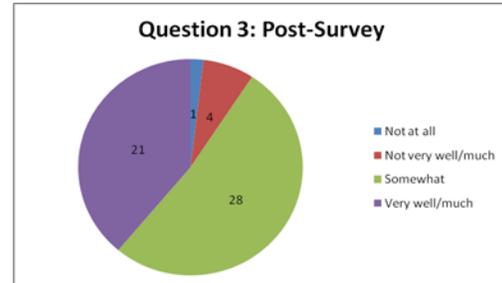


Figure 6: Question 3 Post-Survey



Result Summary

Figure 5 demonstrates the majority of students, 55 percent, felt somewhat confident describing the human characteristics of place, while 17 percent were very confident. The pre-survey also reports zero students feeling completely incapable of describing human place.

After the activities *Figure 6* shows the overwhelming majority of students, 95 percent, either felt fairly comfortable or very comfortable describing the human characteristics of place. Nine percent of students didn't feel very confident and one student had zero confidence describing the human characteristics of place.

Question 4: On a scale from 1-4 how comfortable are you in describing the physical characteristics of a place (what are the landscape and physical features like)?

Figure 7: Question 4 Pre-Survey

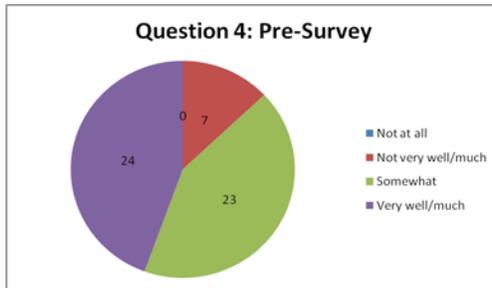
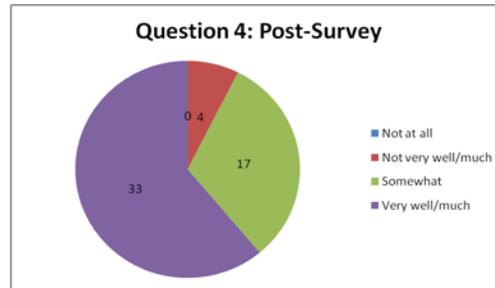


Figure 8: Question 4 Post-Survey



Result Summary

While the previous question asked about the human characteristics of a place or what are the people like in the area, question four focuses on student understanding of the physical aspects of place. *Figure 7* demonstrates previous to working with the GPS units, 87 percent of students felt either somewhat or very comfortable describing the physical characteristics of a place. Only seven students or 13 percent of students didn't feel very comfortable and zero students had no knowledge of this theme.

Figure 8 explains after the activity the number of students who felt very confident in this area rose from 24 students to 33 students, or 18 percent. The number of students who were somewhat confident describing the physical characteristics of place decreased from 23 to 17 students and students feeling somewhat confident with this theme decreased from 13 percent to seven percent.

Question 5: On a scale from 1-4 how good are you at determining spatial distance. In other words if I were to ask you to tell me the distance from the school building to the entrance of the Big Woods how accurate do you think you would be?

Figure 8: Question 5 Pre-Survey

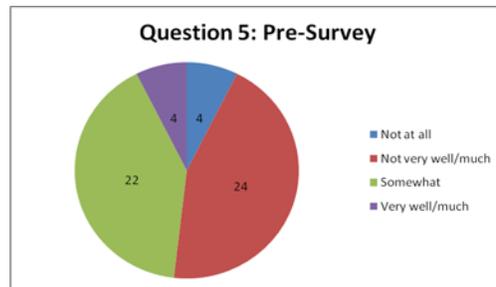
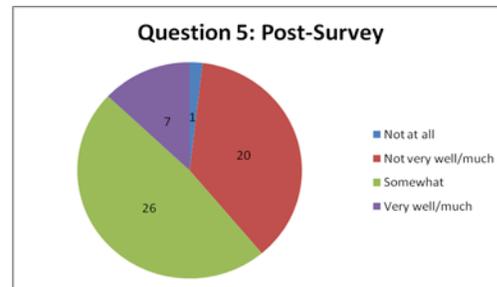


Figure 9: Question 5 Post-Survey



Result Summary

Figure 8 shows before using the GPS units 45 percent of students felt little confidence with their spatial literacy skills while 41 percent felt somewhat confident. On the extremes, 7 percent of students felt very confident while 7 percent of students had zero confidence determining the spatial distance from the school through the Big Woods.

Figure 9 shows the numbers changed slightly after completing the activity. Only one student had zero confidence determining the spatial distance, while the number of students who felt completely confident rose from four to seven students. The students in the somewhat category changed slightly from 41 percent to 48 percent while the students in the not very well category decreases from 45 percent to 37 percent.

Question 6: On a scale from 1-4 how good are you at identifying the human-environment interactions that occur in a place?

Figure 10: Question 6 Pre-Survey

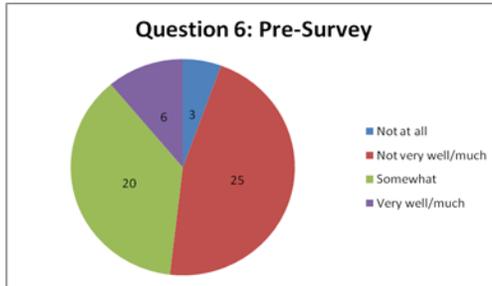
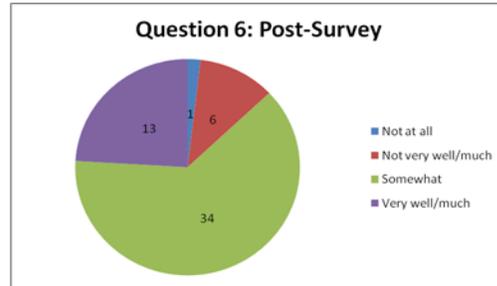


Figure 11: Question 6 Post Survey



Result Summary

Figure 10 indicated over half of the students, 52 percent, felt zero to little confidence describing this theme while 48 percent felt somewhat or very comfortable describing the human-environment interactions of place.

Figure 11 shows after the use of the GPS units and their experience spending time in the Big Woods, the data changed dramatically. The “not very well category” changed from 46 percent before the activities to 11 percent of students feeling the same way after the activities. The number of students who felt somewhat comfortable also changed from 37 percent of students before to 63 percent of students after the activities.

Question 7: On a scale from 1-4 how well can you identify the movement of people in a place?

Figure 12: Question 7 Pre-Survey

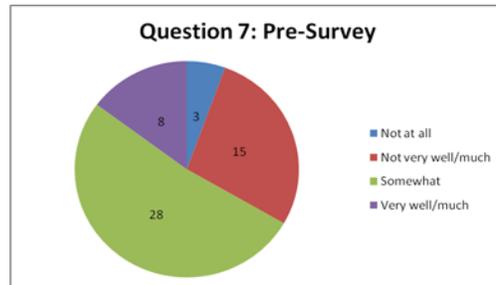
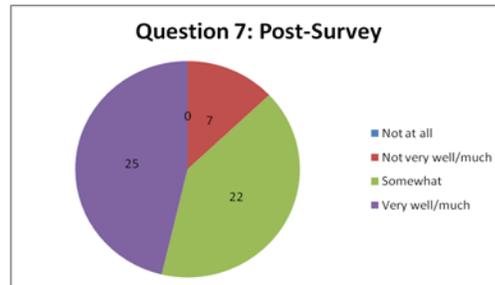


Figure 13: Question 7 Post-Survey



Result Summary

The *Figure 12* shows the majority of students, 51 percent felt somewhat comfortable describing the movement of people in a place while 15 percent felt very confident. Three students or six percent of students felt zero confidence and 15 or 28 percent had zero confidence describing this theme.

Figure 13 describes that after the activities there was a dramatic change with the percent of students feeling very confident describing the movement of people in a place changing from 15 percent to 46 percent. The number of students felt no confidence also decreased from six percent to zero after the activities.

Question 8: On a scale from 1-4 how well can you identify the movement of things in a place?

Figure 14: Question 8 Pre-Survey

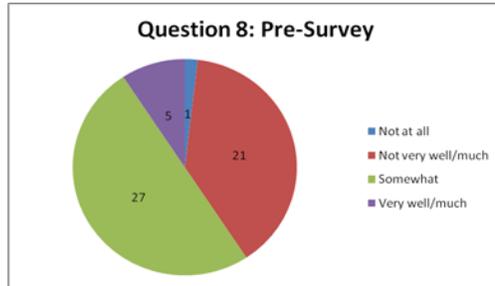
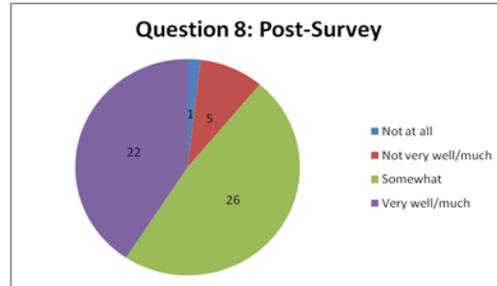


Figure 15: Question 8 Post-Survey



Result Summary

Figure 14 shows the majority, 50 percent of students feeling somewhat comfortable describing the movement of things in a place and nine percent feeling very comfortable. Only two percent of students felt zero confidence and 39 percent felt little confidence describing this aspect of movement.

Figure 15 shows a dramatic increase in the number of students who felt very confident describing how things move in a place. Students in the very confident category increased from nine percent to 51 percent. While the percent of people who felt little confidence decreased from 39 percent to nine percent. The percent of students who felt zero confidence remained at two percent or one student.

Question 9: On a scale from 1-4 how well can you identify the movement of ideas in a place?

Figure 15: Question 9 Pre-Survey

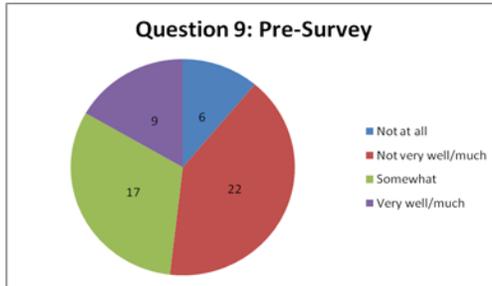
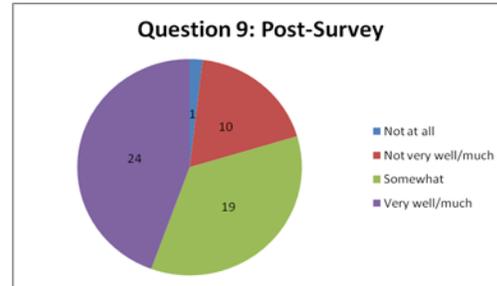


Figure 16: Question 9 Post-Survey



Result Summary

During the pre-survey *Figure 15* represents 11 percent of students reported not being comfortable with describing the movement of ideas in places and 41 percent of student felt little confidence. 31 percent of students reported feel somewhat comfortable and 17 percent reported feeling very comfortable describing this aspect of movement.

After working with the GPS units, *Figure 16* describes the percentage of students feeling very comfortable describing the movement of ideas in a place increased to 44 percent and the number of students who reported feeling somewhat comfortable also increase to 35 percent leaving 19 percent of students having little confidence and two percent of students feeling zero confidence describing how ideas move in a various places.

Question 10: On a scale from 1-4 how good are you at picking out similarities places have with one another and creating a region?

Figure 17: Question 10 Pre-Survey

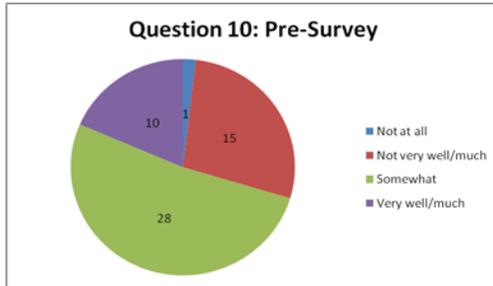
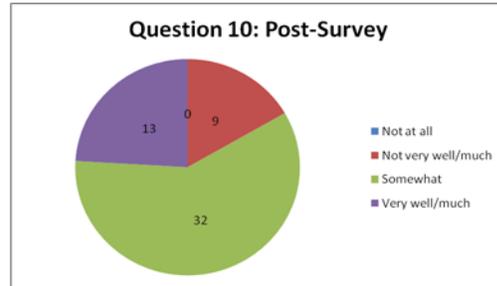


Figure 18: Question 10 Post-Survey



Result Summary

Figure 17 indicates 19 percent of students felt very confident identifying region and 51 percent felt somewhat comfortable. Only 29 percent of students didn't feel confident with region and one percent had zero confidence describing this theme.

Figure 18 shows students felt a slight increase in their ability to identify region. 24 percent of students felt very confident, 59 percent felt somewhat confident and 17 percent didn't feel very confident. No students felt zero confidence identifying region.

Question 11: Have you ever used a GPS (Global Positioning System) before?

Figure 19: Question 11 Pre-Survey

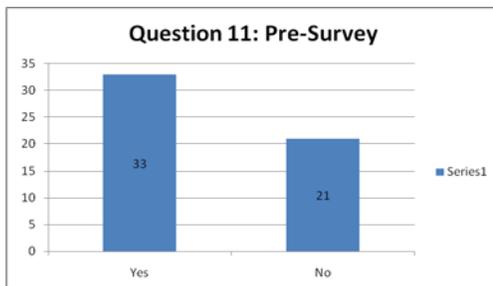
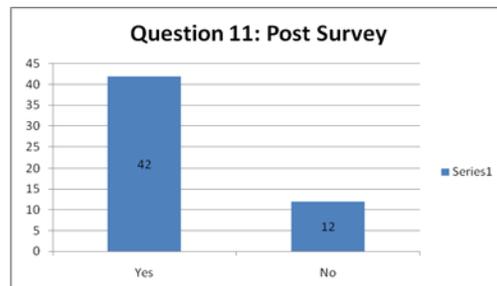


Figure 20: Question 11 Post-Survey



Result Summary

Figure 19 indicates that 33 students or 61 percent of students had used GPS units before while 21 or 39 percent of students had not. As reported in *Figure 20*, after the survey, the number of students who were able to personally operate the devices rose from 61 percent to 78 percent while 22 percent of students had an opportunity to use information given by the GPS units; they still didn't have a chance to personally operate the devices.

Question 12: On a scale from 1-4 how interested are you in learning more about GPS (4 being very interested and 1 being not at all)?

Figure 21: Question 12 Pre-Survey

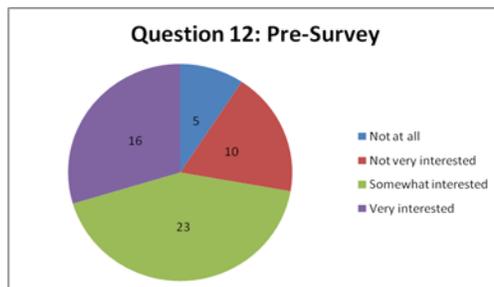
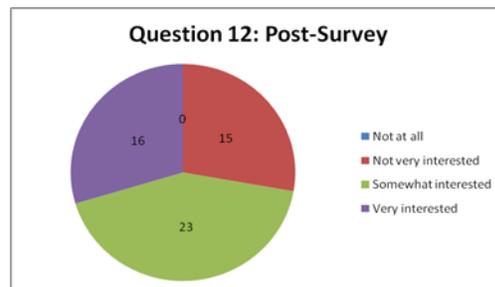


Figure 22: Question 12 Post-Survey



Result Summary

During the pre-survey, nine percent of students had zero interest in learning about GPS technology while 19 percent of students reported not being very interested. 42 percent of students were somewhat interested while 30 percent of students were very interested as indicated in *Figure 21*.

These numbers changed little between the pre and post surveys. While the percentage of students who were somewhat interested and very interested in learning more about GPS technology remained the same between both surveys,

five students who had zero interest in learning about GPS became not very interested (see *Figure 22*).

Question 13: I learn best in the classroom.

Figure 23: Question 13 Pre-Survey

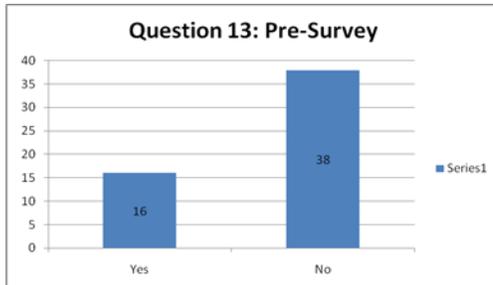
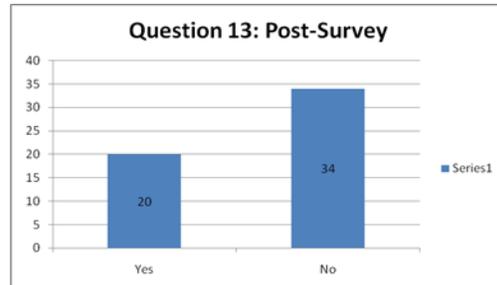


Figure 24: Question 13 Post-Survey



Result Summary

In *Figure 23*, 30 percent of students reported they learned best in a classroom setting while 70 percent of students reported not learning best in the classroom. After the GPS activities taught outside, 37 percent of students felt they learned best in a classroom setting while 63 percent of students reported not learning best in a classroom as shown in *Figure 24*.

Question 14: I learn best in the outdoors.

Figure 25: Question 14 Pre-Survey

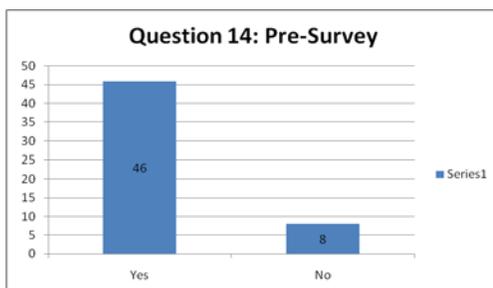
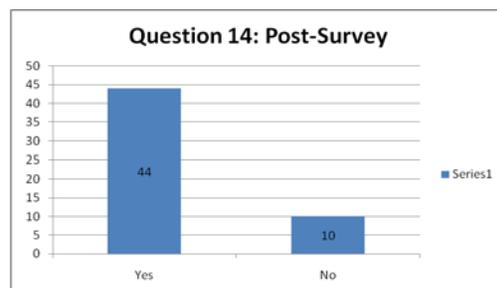


Figure 26: Question 14 Post-Survey



Result Summary

Results in *Figure 25* shows that the overwhelming majority of students, 85 percent felt they learned best outside while 15 percent reported not learning best outside. As indicated in *Figure 26*, the percentage of students who learn best outdoors went down from 85 percent to 81 percent and students who didn't learn best outdoors rose from 15 percent to 19 percent.

Question 15: On an average weekday, how many hours do you use media devices (talking on the phone, watching television, using the computer, listening to the radio, I-pod etc.)?

Figure 27: Question 15 Pre-Survey

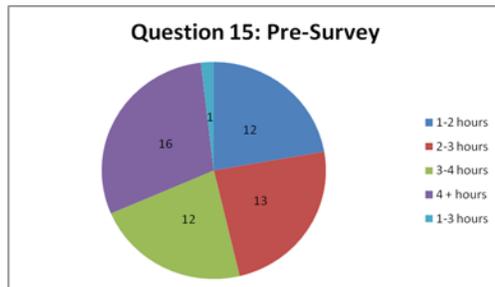
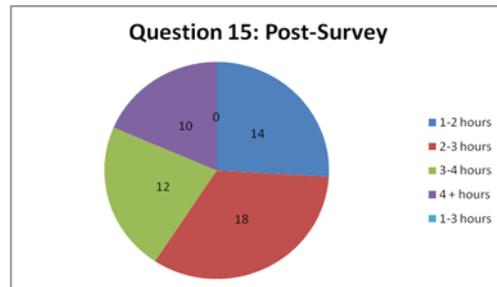


Figure 28: Question 15 Post-Survey



Result Summary

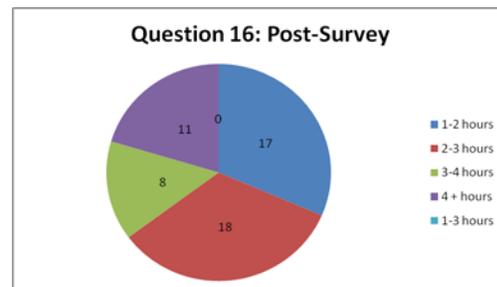
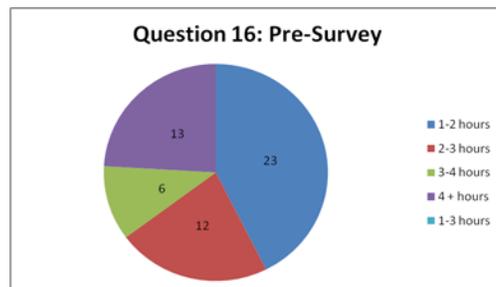
Figure 27 represents 22 percent or 12 students used media devices from one to two hours. 13 students or 24 percent used media devices two to three hours per night. Another 22 percent of students used media devices three to four hours a night and the highest number of student, 16 or 30 percent used media devices for more than four hours a night. One student on the pre-survey indicated that they spent anywhere from one to three hours a night using media devices.

Figure 28 shows some small changes. Zero students indicated one to three hours and the number of students who used media devices one to two hours increase from 12 to 14 students. The number of students who used media devices two to three hours per night also rose from 13 to 16 students. The category from three to four hours stayed the same with 12 students while the number of students who use media devices for more than four hours a night declined from 16 students to 10 students.

Question 16: On an average weekday, how many hours do you spend outside?

Figure 29: Question 16 Pre-Survey

Figure 30: Question 16 Post-Survey



Result Summary

Figure 29 indicates that 42 percent of students spent one to two hours outdoors after school on weeknights. 22 percent spent two to three hours a night, 11 percent spent three to four hours while 24 percent spent over four hours outdoor a night.

Figure 30 represents how much time students spent outdoors a night on weeknights after the GPS activities. Percentage of students spending one to two hours a night outdoors decreased from 42 percent to 31 percent. Percentage of

students spending two to three hours outdoors had a slight increase from 22 percent to 34 percent. Students spending 3-4 hours also increased slightly from 11 percent to 15 percent and few students, 20 percent spent over four hours outdoors on school nights.

Question 17: Do you prefer spending more time inside using media devices or outdoors?

Figure 31: Question 17 Pre-Survey

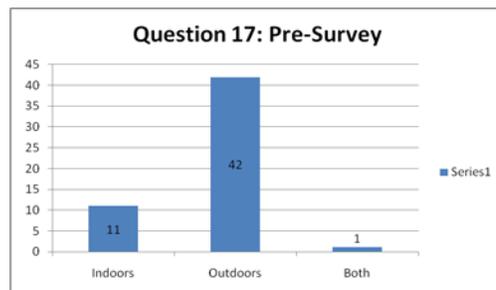
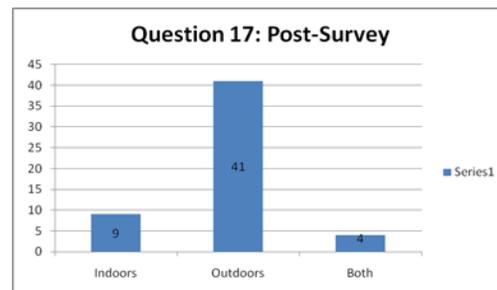


Figure 32: Question 17 Post-Survey



Result Summery

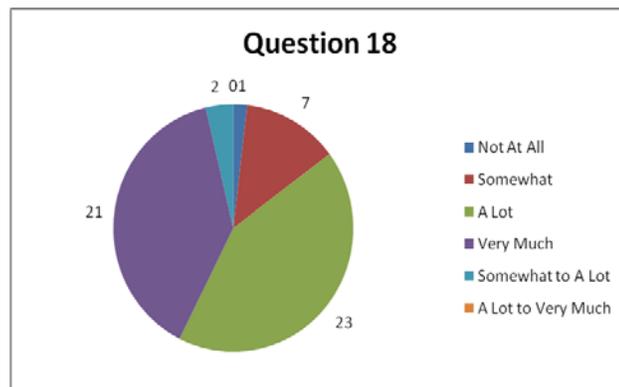
During the pre-survey 11 students or 20 percent indicated they liked to be indoors while 78 percent of students choose the outdoors option as shown in *Figure 31*. One student or two percent of students chose both indoors and outdoors. The post-survey, or *Figure 32* indicates close numbers, where nine students or 16 percent enjoyed being indoors and 76 percent or 41 students reported they enjoyed being outdoors. Four students or 8 percent decided that they enjoyed both activities equally.

Post-Activity Questions

The next set of survey questions were presented to the students the day after completing the final GPS activity. These subjective questions were asked to get general feedback on the students' enjoyment of the activities.

Question 18: On a scale from 1-4 how much did you enjoy completing the Five Themes GPS activity?

Figure 33: Question 18

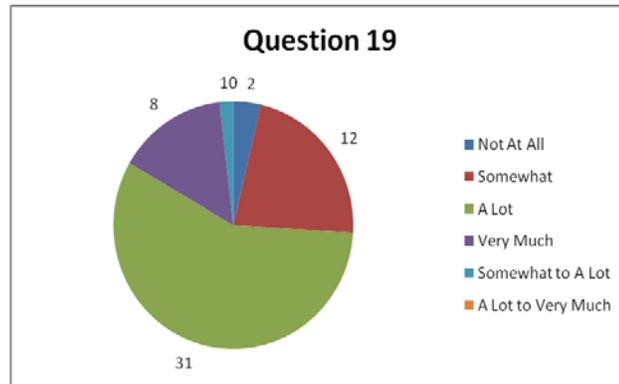


Result Summary

Figure 33 shows the level of student enjoyment of the GPS activities. As shown above one student or two percent of students strongly disliked the activity, 13 percent or seven students somewhat enjoyed the activity. Twenty three students or 42 percent enjoyed the activities a lot while 39 percent or 21 students very much enjoyed the activities. Two students or four percent expressed they somewhat to a lot enjoyed the activity.

Question 19: On a scale from 1-4 how much do you think it helped you to understand the Five Themes?

Figure 34: Question 19

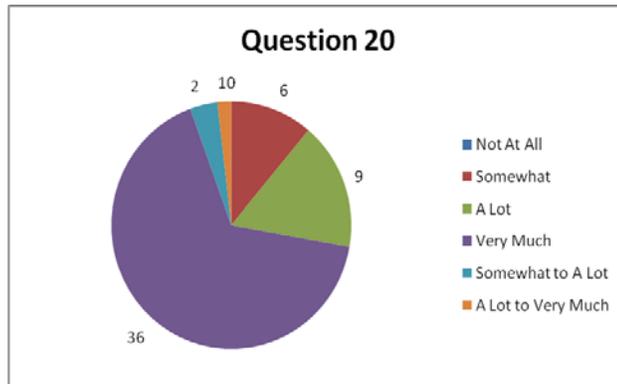


Result Summary

As indicated in *Figure 34*, four percent or two students felt that using the GPS units and completing the GPS activities did not help them to better understand the five themes of geography. Twelve students or 22 percent felt the use of GPS somewhat helped them, while 31 or 57 students described the use of GPS as helping them a lot. One described the activities helped them somewhat to a lot. Eight students or 15 percent indicated the activities to be very beneficial in their understanding of the five themes of geography.

Question 20: On a scale from 1-4 how much would you like to do an activity using the GPS systems again?

Figure 35: Question 20



Result Summary

Figure 35 shows the students' desire to complete another activity using GPS devices in class. Zero students did not want to complete another activity. Six students or 11 percent indicated somewhat wanted to complete another activity while 9 students or 17 percent wanted to complete another activity a lot while two students or four percent had somewhat to a lot of desire to complete another activity. Thirty six students or 66 percent would very much enjoy completing another activity. One student or two percent had a lot to very much desire to complete another activity using the GPS units.

CHAPTER FIVE:

CONCLUSIONS

The following chapter provides an in-depth discussion of student survey results and draws conclusions based upon those results and previous work mentioned in the literature review. It further mentions limitations of this particular study, suggestions for future study on this topic and implications this study will have in the educational and environmental fields.

Synthesis of Survey Questions

Question 1: On a scale from 1-4 how well can you identify the absolute location of a place?

For this particular question the researcher wanted gather data on how comfortable students were using absolute location. Location is usually the first of the five themes taught in the curriculum because of the straight forward nature of the theme. Students in the St. Michael/Albertville district have had exposure to absolute location or latitude and longitudinal coordinates since their fourth-grade year. However, looking at the curriculum from the elementary schools as well as the sixth-grade curriculum, no teachers in the district until this year have used GPS devices in teaching absolute location or any of the other five themes with this particular group of students. This past fall, the researcher also spent a couple of days reviewing with students, identifying the absolute location of various places around the world using maps and students seemed to grasp the concept fairly easily.

Given the amount of background knowledge students had on absolute location going into their seventh-grade year and comparing graded activities on absolute location from the beginning of the year, the researcher finds these results to be somewhat indicative of student knowledge at this point in the year. However, the researcher would have expected students to feel a little more confidence describing the absolute location of a place as they have studied it various times throughout this and previous years. Furthermore, the nature of the question could have created a discrepancy. Some students may have thought the question was asking them if they knew the absolute location of STMA Middle School, which would have been challenging for many of them at that moment not having worked with GPS units or taught the absolute location of their school and community before.

Despite the possible discrepancies, the results in *Figures 1 and 2* show that the use of GPS units in teaching absolute location to students to be beneficial for the vast majority. Students were able to pin-point their exact location in the world through identifying absolute location first hand. However as indicated in *Figure 2* there was still 26 percent or 14 students who indicated they still didn't have a solid knowledge of absolute location after completing the activities. Once again, students may have thought the question was asking them about the exact location of the school, not in general.

Another reason for the 26 percent of students still not feeling very comfortable identifying the absolute location may have been because there were only six GPS units available for students to use during the activities, therefore

each group chose one person to be the expert in using the GPS devices leaving some students without the opportunity to work with the GPS's which could have contributed to some students lack of confidence with absolute location.

Question 2: On a scale from 1-4 how well can you describe the relative location of a place?

In the seventh grade geography curriculum we teach relative location to mean the understanding where places are in relation to other places using direction coordinates of North, South East and West. Throughout the year the researcher encouraged students to continuously use these terms even when describing places informally. Students learn about relative location since early elementary school, the term *relative location* was re-taught to students this year. This particular theme also contributes to student knowledge of spatial literacy or their understanding of where places are in relation to other places.

The results in *Figures 3 and 4* show a significant increase in student understanding of relative location. The number of students who felt very confident in describing relative location increased from 20 students to 33 students or to 61 percent of the student population tested. Thirty percent of students identified themselves as somewhat comfortable and only nine percent or five students identified themselves as feeling not very comfortable.

These results show completing the GPS activities helped the majority of the students to understand and feel comfortable describing the theme of relative location. The success for most students in this particular activity may have

occurred through the use of the internal compass in the GPS units. The activity question asked students to identify various places or things that were to the North, South, East and West of them. Students used their GPS devices to help orient them in order to complete the question.

There could have been a number of reasons for the five students who still felt uncomfortable describing this theme. First, throughout the activities the researcher gave little direct instruction on answering the questions. Students were expected to use their previous knowledge of the five themes and work together with their groups to figure out the answers. Some students may have needed more direct instruction using the compass on the GPS devices. Furthermore, the distractions of the outdoors and other students may have contributed to the lack of understanding of this theme.

Question 3: On a scale from 1-4 how comfortable are you in describing the human characteristics of a place (in other words, what are the people like)?

Question three was designed to see how confident students were in describing the human characteristics of a place. In presenting the theme of place to students earlier in the year the researcher found the majority of students to struggle identifying the human characteristics more than the physical characteristics of place (asked about in question four).

Overall there was a general increase in student confidence level describing this theme. The percentage of students feeling very comfortable describing this aspect of place rose from 17 to 39 percent as indicated in *Figures 5 and 6*. The

percentage of students feeling somewhat comfortable remained similar and went from 55 to 52 percent and the number students not feeling very comfortable describing this theme decreased from 28 percent to seven percent.

There was one student who went from feeling not very comfortable to not being comfortable at all describing human place. While that statistic surprises the researcher, it may have been because the majority of the activities took place in a highly wooded area out of view of human settlement. Students had to make abstract connections to come up with human characteristics. In order to answer this question students needed to take a broader look at how humans created the particular environment they were in. While there wasn't much in terms of human development many students were able to look beyond the particular scene and understand that while humans were creating the farms and communities outside of the forest, they made the choice to leave the wooded area that they were in as well as develop the trails, put up animal houses and create drainage systems, therefore showing the values of the people who settled and developed this area over time.

Question 4: On a scale from 1-4 how comfortable are you in describing the physical characteristics of a place (what are the landscape and physical features like)?

In teaching about the physical geography of places throughout the year, the researcher found students were the most confident describing this theme than any of the other of the five themes. The physical aspect of place looks at the geographical features or landscape of an area. Because this theme is very visual

and straight forward, students were able to pick out a number of physical features where the geocache was hidden.

Throughout each chapter students study this theme in their textbooks and also spend at least one day discussing the physical features of a particular area giving students practice identifying the physical aspects of place on a weekly basis. The researcher believes the results in the pre-survey, *Figure 7*, reflect these practices by having zero students feeling no confidence in describing the physical aspects of place and only seven students not feeling very confident with this theme. *Figure 8* shows even more improvement in knowledge and confidence with this theme with 62 percent of students feeling very confident and 31 percent of students feeling somewhat confident describing the physical aspects of place. There were only three students or seven percent who still didn't feel very comfortable describing this theme.

Question 5: On a scale from 1-4 how good are you at determining spatial distance. In other words if I were to ask you to tell me the distance from the school building to the entrance of the Big Woods how accurate do you think you would be?

This question moves from asking about the five themes to spatial literacy, another important aspect of understanding geography. Throughout the year we discussed and compared size of countries and regions as well as the volume of lake and river water in various parts of the world but have not discussed or completed many activities relating to actual distances between places. In

discussing the topic of spatial literacy earlier in the year with other math and social studies teachers in my school, it became apparent that our students struggle visualizing distance and putting spatial concepts into real life practice. This question was also asked with the knowledge that all students have had the opportunity to walk the distance asked in the question either during my class or other classes.

In completing this part of the study, students were asked to predict how far it would be to walk from the school around the Big Woods trail and back. Then they were to check their GPS units at the end of the activity to see if their predictions were close or far off. While observing students answering this question, many were very surprised at how far off their answers were. A number of students guess areas in the range of three to four miles with the actual distance being 1.24 miles.

Figures 8 and 9 shows a slight change in student confidence with spatial distance. The percentage of students feeling very comfortable before the activities was relatively low, at seven percent, compared to the 14 percent of students after the activity. The number of students feeling somewhat comfortable describing spatial distance was at 22 while the highest category was students feeling not very comfortable at 24 students. The post-survey reported a slight increase in the number of students feeling very comfortable describing spatial distance to 13 percent. The somewhat category also increased slightly with 26 students. However, 20 students still didn't feel very comfortable picking out spatial distance and one student felt zero confidence with this topic.

These results could show the use of GPS technology in teaching this topic may faintly benefit students in learning more about spatial literacy. It could also indicate that more direct instruction on spatial literacy and practice with using the GPS features may also be beneficial to students when discussing the idea of space and distance.

Question 6: On a scale from 1-4 how good are you at identifying the human-environment interactions that occur in a place?

Question six looks at the third of the five geographical themes, human environment interaction, or exploring how humans change the environment and how the environments in which humans live changes them. Students discussed this theme directly during the beginning of the year and study it throughout every region of the world. Therefore, the lower results of the pre-survey shown in *Figure 10* surprised the researcher. One reason for these statistics could be that the researcher neglected to use the term *human-environment interaction* when discussing how humans affect the environment in which they live and visa versa. This is also a more abstract theme where students need to look at physical evidence from cultures and physical areas from around the world, develop empathy for various cultures to understand how their physical environment would affect them, challenging for many students at this level.

Students seeing the effects of human activity in an area first hand may have contributed to this increase of confidence describing this theme shown in *Figure 11*. Although the cache was hidden in a heavily forested area, the

researcher chose the location where evidence of human activity could be viewed and further discussed.

Question 7: On a scale from 1-4 how well can you identify the movement of people in a place?

Question seven looks at one aspect of the fourth theme of geography, movement. This particular question represents the movement of people within the various places we study. In other words, it answers the question; how do people get around in a particular place? While movement of people is referred to in the textbook for the places students study, the researcher generally only mentions this theme in class lectures, activities and discussions if the movement of people in the particular region is unique or leads to an important aspect of their culture. Therefore it would have been challenging for most students to see the connection between the unique forms of movement in their community. However the numbers report a dramatic change in student confidence describing this particular aspect of movement.

The change in the numbers shown between *Figures 12 and 13* could have related to the placement of the particular cache. The researcher hid the movement cache in an area where aspects of all three parts to the movement were clearly visible. But like the human-environment interaction theme, movement also requires a fair amount of critical thinking skills in order to recognize all of the possibilities of movement within a place. Students were able to pick up on how

people move within our area very well through seeing examples of this type of movement first hand.

Question 8: On a scale from 1-4 how well can you identify the movement of things in a place?

Question eight looks at how comfortable students felt determining how things moved within a place. This particular part of the theme of movement is to mention very little in both the textbook as well as in class activities. However, it proves to be more basic than the other two subjects of movement.

As with question seven, the use of GPS units and potentially the area where the geocache was hidden may have affected the increase in students' understanding of this topic shown in *Figures 14 and 15*. With one class of students there was also a semi truck carrying cargo that passed us while students were completing the cache activity for this theme, providing a clear example of how things are moved in their community.

Question 9: On a scale from 1-4 how well can you identify the movement of ideas in a place?

Question nine refers to the third part of the movement theme, ideas. Out of the three parts of movement, this particular topic proves to be the most abstract; however continues to be more important for students to understand as our world becomes more interconnected with the use of technology. This part of the movement is also something students in this generation can relate to on a

personal level with their increased knowledge and use of communication technology such as facebook, instant messaging and cellular phones (Currwood, 1990).

Again we see a significant increase in the confidence level of students describing the movement of ideas in *Figures 16 and 17*. These results could be attributed to the area the geocache was hidden and students seeing evidence of the movement of ideas within their own environment.

Question 10: On a scale from 1-4 how good are you at picking out similarities places have with one another and creating a region?

The final theme students studied within this activity was region. This theme is typically the hardest for students to identify and understand because there are infinite ways region can be defined. It also requires students to identify multiple similarities along with abstract concepts. The researcher was surprised that pre-survey, *Figure 18*, suggests 19 percent of students felt very comfortable identifying region and 51 percent felt somewhat comfortable. During class discussions, students often struggle to see the similar characteristics of the places that we study. They have an even harder time identifying the differences in places. However, student confidence level at first could be because the researcher mentioned the term region in class numerous times during lectures. Students also go through the characteristics of each region they study at the beginning of the unit.

During the activity, students discussed each of their responses for the first four themes and made several comparisons on what they observed in the Big Woods to other areas they have been to around the state and country. Results in *Figure 19* prove this activity to be beneficial to students in visualizing the various aspects of St. Michael and making comparisons to different places.

Question 11: Have you ever used a GPS (Global Positioning System) before?

For this question the researcher wanted to find out how many students had experience using GPS devices to get an idea of how much the researcher would need to teach about the history and functions of GPS devices. Because 21 students reported no experience with the devices (as indicated in *Figure 20*) the researcher decided to give students a 20 minute background lesson on GPS to provide an overview of the technology they would be using.

Figure 21, the post survey showed how many students were able to use the GPS devices throughout the two activities students completed. The researcher's goal in the beginning of the study was to have all students the opportunities to personally operate the devices however; because our school only has six units, the researcher's goal proved to be a challenge given the limited amount of time set aside to complete the activities. However, while not all students had the opportunity to operate the machines, all students participated in using the information provided by the GPS units when completing the activity assignments in their small groups.

The researcher also speculates that this question may have not been clear to students given that 12 students indicated in the post-survey that they did not have a chance to work with the devices. However, though observation competed by the researcher during the activities, there seemed to be a number of students trading devices and operating the machines even though they weren't technically holding or in charge of them. Some students may have thought the researcher meant if they had worked with GPS devices outside of school. From the researcher's perspective, because all students were gathering information from the GPS units, the researcher generally felt that all students completing the activities had the opportunity to work the GPS devices even if they weren't the ones directly handling them. However these results also show another problem in completing this study using subjective responses.

Question 12: On a scale from 1-4 how interested are you in learning more about GPS (4 being very interested and 1 being not at all)?

Much like question 11, the researcher wanted to get an idea of how interested students were in using the GPS devices before we started to work with them in class. The researcher also wanted to see how many students were interested in working with the units during future class activities. The numbers in *Figures 21 and 22* proved to change little between the pre and post-surveys. However all of the students who had zero interest gained more interest after completing the activities, leaving zero students who had no interest at all in learning more about GPS.

Question 13: I learn best in the classroom.

For questions 13 and 14 the researcher wanted to get a better idea of the learning environment students felt most comfortable in and if their opinions changed throughout the course of the activities. Since GPS technology can only be used outdoors, this question is pertinent in understanding the overall effectiveness of using the GPS devices.

Figures 23 and 24 report the majority of students indicated that they did not learn best inside the classroom, after completing the GPS activities outside the classroom, four students changed their opinion and indicated that they learn best inside the classroom. These results show that while the majority of students benefited from the use of GPS technology outdoors in their understanding of the five geographical themes and spatial literacy, some students learned they felt more productive inside the classroom.

Question 14: I learn best in the outdoors.

On the opposite end of the spectrum with question 14, the researcher wanted to see how students felt about learning outdoors. Most students have had an opportunity to have class outside during my class or with another teacher before completing this to this survey. Because questions 13 and 14 were two separate questions there were students who felt they learned best in both locations.

Figures 25 and 26 proved to be similar to that of Question 13 with two students deciding that they didn't learn best outdoors after completing the GPS activities outside. The results of this question pose a problem because most GPS units can only be used outside leaving less room for in classroom learning to please the 37 percent of students who indicated learn best in the classroom.

Looking back, the researcher should have reworded questions 13 and 14 to present the opportunity to compare indoor and outdoor learning preferences as well as given students an option to choose both indoor and outdoor.

Question 15: On an average weekday, how many hours do you use media devices (talking on the phone, watching television, using the computer, listening to the radio, I-pod etc.)?

For question 15 the researcher wanted to get an idea of how much time students were spending using media devices outside of the school day. When the researcher first designed the study she wanted to see how much time students were spending outside and if the use of GPS technology would encourage students to spend more time outdoors. However, as the researcher continued in the study and narrowed the focus to the five geographical themes and spatial literacy, this question proved to be unnecessary.

The researcher expected to see students in the higher hourly range however for both the pre and post survey however; student responses were almost even within each of the hourly categories as indicated in *Figures 27 and 28*. One student on the pre-survey indicated that they spent anywhere from one to three

hours a night using media devices. Indicating to the researcher that the range the researcher gave students in the surveys may not have been sufficient given the various schedules students have with sports and other organized activities throughout the week.

This question may also not been fair or presented in the most objective form. Throughout the year the researcher had many discussions with the students about their generation's title 'IM' standing for Instant Message generation and their use of technology being a defining factor for them. Students also discussed ideas presented by Louv (2008) and other researchers suggesting students in their generation don't get outside as much as kids in previous generations and how that might have negative effects. Throughout the year the researcher also voiced her opinion regarding this issue in previous lessons therefore students may have felt obligated to say they didn't used media devices as much as they did.

Also when the researcher gave examples of media devices she neglected to write text messaging as an example (one thing the researcher feels is very popular with this age of students). The change between *Figures 27 and 28* could indicate a change in the season where students may have begun playing a sport or another activity decreasing their time to spend using media devices each night.

Question 16: On an average weekday, how many hours do you spend outside?

In asking this question the researcher wanted to see if the amount of time students were using media devices could affect student's motivation and desire to

learn more about GPS units, a newer technology to most students. As the same with Question 15, the researcher originally asked this question to get a better idea if students would spend more time outdoors if they had a GPS device, or if the use of GPS would encourage students to spend more time outdoors.

In most schools, teachers are striving to meet the individual needs of each student by changing around by giving multiple intelligence tests to key in on how the individual learns best and design lessons appropriately, allowing for more choice on projects and assessment and finding content articles that match the student's reading level. So the question is if we are doing so much work to meet the needs of students, are we ignoring the overwhelming major of students who believe they learn best outdoors? Are we also providing students a disservice in not exposing them to the widespread technology the majority of students will use in the future?

Question 17: Do you prefer spending more time inside using media devises or outdoors?

Question 17 was also designed with the idea that the researcher was going to be gathering data to try to explain if the use of GPS would encourage students to spend more time outdoors. While information from questions 15, 16 and 17 do not pertain directly to the study, the results will be useful for teaching these students in the future.

For this question the researcher wanted to see how much students enjoyed being outdoors and if many students do, then why not continue to develop more

ways that students can get outdoors. The researcher also wanted to get an idea of how many students would choose to be indoors using their media devices or outdoors without them. The researcher was surprised when looking at the results as to how many students enjoyed being outdoors rather than indoors. Even though there was not an option for students to write both, some students keyed in both the A and B button to indicate they like them both equally.

Post-Activity Questions

The next set of survey questions were presented to students the day after completing the final GPS activity. These subjective questions were asked to get general feedback of students' enjoyment of the activities.

Question 18: On a scale from 1-4 how much did you enjoy completing the Five Themes GPS activity?

In asking question 18 the researcher wanted to get an idea of how much students enjoyed working with the GPS units. In looking at the results from *Figure 33*, students generally enjoyed completing the activities. Only one student did not enjoy working with the GPS unit out of the 54 students who completed the activity. Strong numbers indicate this to be a successful activity in terms of student enjoyment.

Question 18 also included space for students to explain what they thought of the activity in their own words below is a sample taken from students who indicated they enjoyed the activities *a lot* and those that *very much* enjoyed the activities.

Student #1: "I thought this was one of the best things we've done all year."

Student #2: "Very fun!"

Student #3: "I enjoyed being outside in the fresh air learning."

Below are comments from the group of eight students who reported not liking or somewhat liking the activities.

Student #4: "I got tired easily and almost fell asleep in the next class."

Student #5: "I really liked being outside but I didn't like the pricklies."

Student #6: "I was not very fond of tripping and falling on the woodchips on the trail."

The above comments are evidence that while the majority of students enjoy learning outdoors; some students will learn best in a traditional classroom setting. The comments also show basic concerns teachers and students have about taking learning outdoors. Much preparation is needed to make sure proper instructions are given to students about general plants and animals to avoid in the woods and precautionary measures are taken to insure student safety. However while these concerns are legitimate, the overwhelmingly positive comments students made regarding the GPS activities and the opportunity to learn outdoors

provide evidence that students would benefit from the incorporation of more GPS activities.

Question 19: On a scale from 1-4 how much do you think it helped you to understand the Five Themes?

Question 19 asked students to rank how well working with the GPS units helped them in understanding the five themes of geography. Again we see their responses, shown in *Figure 34*, indicate the use of GPS to be beneficial in helping the majority of students learn the five themes of geography. With 57 percent indicating the use of GPS activities helped them to understand the five themes of geography *a lot* and 15 percent indicating the activities helped *very much*, we see a very positive response to the learning process. In addition, only four percent of students mentioned the activities did not help them to understand the five themes and 22 percent said the activities *somewhat* helped them understand the themes. One students indicated feeling GPS helped them to understand the five themes *somewhat to a lot*.

While this information is subjective and based on student opinion, the numbers show confidence levels in understanding each of the five themes to rise after the use of GPS activities. Interestingly enough, the two students who indicated not learning anything from the activities mentioned these comments in their survey, “We should do it more often” and “It was very fun and I like the part when I cut through the woods.” So while two students indicated not learning from the activities they still had a positive view of the activities.

Question 20: On a scale from 1-4 how much would you like to do an activity using GPS systems again?

Question 20 asked students to rate their want to do the activity again. Similar to the pervious responses, the overwhelming majority, 66 percent of students, indicated their desire to complete another GPS activity *very much*, 17 percent wanting to *a lot* on students fell in the middle of *a lot* and *very much*, leaving zero students not wanting to complete another activity and only 11 percent wanting to somewhat complete another GPS activity. There were also two students who fell in between *somewhat* and *a lot*.

Student responses proved these activities are beneficial to student learning and show that activities such as this should continue to be implemented as much as possible throughout various school districts.

General Observations

Numerous observations can be made when looking at the overall data collected in this study. As shown in questions one, two, three, four, six, seven, eight, nine, ten and eleven, there was a significant increase in student understanding of the five themes of geography after completing the GPS activities. Questions seven through nine regarding the theme of movement saw the greatest increase in student knowledge. The theme of region saw the least amount of increase in student understandability between the pre and post surveys. The themes of location, place and human-environment interaction also saw

significant increases in students' knowledge between the pre and post surveys. These results show the impact use of GPS technology can have a significant impact on student learning of the Five Themes of Geography.

Results also show that the use of GPS devices have a slight impact on student knowledge of spatial literacy. While the numbers increased from the pre to post survey, there was only a slight change that would indicate these activities to have a positive impact on students' abilities to determine spatial distance. The researcher believes the slight increase would suggest more direct instruction of spatial literacy and how to acquire information regarding space and distance from the GPS units needs to occur throughout the GPS activities. When designing the activities, the researcher focused mainly on the aspects of the five themes of geography and little on the information GPS units provide about spatial distance. The researcher believes this concept would have been taught better if a separate activity or lesson was given on understanding spatial literacy and having students discover the functions relating to spatial literacy the GPS unit provides.

The final area of study looked at locations where students say they learn best. Questions 13 and 14 were asked to get a better understanding of a students' ability and desire to learn outside of the classroom given the GPS units available to the students can only be used outdoors. Throughout all of the activities students spent between two and two and a half hours learning outdoors. While most students had experience spending part to a full class period outdoors, this experience brought students out for two full class periods.

Results remained strong in indicated the majority of students prefer learning outdoors; they also show a slight decrease in the enjoyment of learning outdoors after the activities took place. In question 13 four more students indicate they learned best in the classroom after completing the GPS activities outdoors. Question 14 continues this trend where two fewer students indicated they learned best outdoors in the post-survey. These results show more consideration needs to be taken in understanding where students learn best. Teachers also need to be sensitive of those students who may not learn best outdoors and provide opportunities that match all learning preferences.

Connection to Literature Review

Interacting with the environment/outdoors proved to be a valuable tool for students in understanding the Five Themes of Geography. In accordance with Hill “Geography is not mere place, names – capitals, countries, and rivers – but rather the whole science of the significance of location” (1989, p. 2). Through using GPS to explore their local community, students were able to investigate the place they live in. Rather than simply identifying a deciduous forest, they identified the human-environment interactions that take place in a deciduous forest and explained the effects those interactions have on the people, wildlife and plant communities of their local area. Instead of simply locating St. Michael, MN on a map, students discussed how their location affected the transportation of ideas, goods and people throughout their communities. Each one of the GPS

activities brought students closer to developing a strong sense of place for their local community.

Working with the GPS units also provided a type of learning experiences supported by Louv (2008). “Much of our learning comes from doing, from making, from feeling with our hands; and though many would like to believe otherwise, the world is not entirely available from a keyboard.” (2008, p. 93). Not only were students immersed in their natural surroundings, but they were also learning important geographical skills through active participation.

Creating personal experiences through connecting students to their communities supports the type of geography curriculum backed by the two expert teachers studied by Brooks in 2006. As well as by Backler and Stoltman (1986) “Knowing where things are is only the first step in attaining geographic literacy. Ultimately, geography is concerned with understanding why things are located where they are. To answer this type of question requires the use of a wide range of geographic themes, concepts and skills.” (1986, p. 1).

Limitations

The weather played a role in the time period in which the activities were able to take place. The researcher was able to complete lesson number one with both groups on one day however; the weather patterns shifted and the area experienced a cold snap that was too cold for students to spend over 60 minutes outside with minimal warm cloths. After the cold snap the snow melted making it too muddy to be able to hide the geocaches.

Suggestions for Change and Future Study

In designing and implementing this study the researcher came across a number of things I would do differently in a future study of this topic. The area the researcher struggled with most was not having a control group to compare responses. While it is clear from my study that the incorporation of GPS technology had a positive effect on student learning of the five themes of geography, could students have simply benefited the same amount by spending time in class review the themes as we did in the beginning of the school year?

The timing of the activities could have also played a role in student responses. Before starting the study students were taught each of the themes during the first two weeks of school, or over seven months prior to the study. While they were indirectly exposed to each of the themes throughout the various units of study, no further direct instructions took place in class after the first two weeks of school. After the pre-survey, the researcher gave students a 20 minute review of the five themes using the PowerPoint presentation she used at the beginning of the year. It is possible students may have simply benefited from the in class review of the information rather than the GPS activities themselves. The results may prove to be more accurate if the study was completed during the beginning of the year.

The researcher also struggled with using subjective responses as the basis for the study. While the researcher believes the majority of students gave honest responses to the questions, students at the middle level are more likely to over or

underestimate their ability levels than adults. These over or underestimations could have a profound impact on the study. Therefore next time the researcher will create an objective pre-assessment on the five themes of geography and a post-assessment to understand better the impact GPS has on student learning.

Another way to achieve the goal of getting more objective data would be to have a control class. The researcher will design two units on the five themes. One would incorporate the GPS units and one wouldn't. The researcher will teach each unit to a different group of students at the same time and give students pre and post assessments as well as pre and post surveys and compare the results. In the newly designed units the researcher will also include more direct instruction on the functions of the GPS units regarding the idea of distance and spatial literacy.

When reviewing and interpreting the data the researcher struggled with deciphering the rating scales created. For both the pre and post survey the researcher used a rating scale from one to four and gave students guidelines that represented each number. For the majority of the questions in the pre and post survey the researcher used number one to represent *not at all*, number two to represent not *very well/all*, number three to represent *somewhat* and number four to represent *very much/well*. In the future the researcher will change the terms to give a clearer view for each of the numbers. For example, there seemed to be an area in between somewhat and very much/well that was missing for students who felt a significant impact but didn't necessarily consider it to be the biggest impact.

The researcher also struggled with the terms used for the three question post survey (questions 18-20). For ranking number one the researcher used *not at all*, for number two she used the term *somewhat*, for number three she used *a lot* and for number four she used *very much*. Looking back on these terms, numbers three and four, or *a lot* and *very much*, seemed too similar in their meaning and may have confused some students when completing the survey. In a future study the researcher will make sure to use example statements that vary more from one another and provide students with a better understand of the ranking scale.

In addition to the ranking titles the researcher will also change some of the questions used in the pre and post surveys. In adding questions 13 and 14, the researcher's goal was to get a better understanding of a location in which students feel they learn best; however, the researcher does not believe this was achieved as accurately as it could have been. In future studies she will ask in one question where they feel they learn best and give the options of indoors, outdoors or both. This way the researcher will have straight forward data to help determine first if learning outdoors is beneficial for students, as they would need to be outdoors to complete the GPS activities.

When first designing my study the researcher added questions 15, 16 and 17 to see if there would be a correlation between students who use modern media technology regularly throughout the day and desire to learn more about and work with GPS units given they are a form or modern technology. However, as the researcher continued with her research, she realized she was taking on more than one capstone could handle. Therefore the researcher decided to focus on how

GPS technology affects student learning of basic geographical principles making question 15, 16 and 17 irrelevant to the study.

In taking out questions 15, 16 and 17, the researcher will add more questions relating to the idea of developing a sense of place or connection with their local community/environment. While students were asked about the human and physical knowledge of place they gained through completing the activities, there were no clear questions relating to the connection to the Big Woods after gaining the knowledge of that area. The researcher believes a clearer question relating to sense of place will prove to be beneficial for this study.

In the future the researcher would like to expand this study to look at how the incorporation of GPS technology affects student motivation to learn in a geography class. While the majority of students saw an increase in their personal knowledge of the basic geographical principals, the majority of students also indicated they would like to complete more activities using GPS units and that they enjoyed completing the activities. Does their enjoyment of the activities themselves correlate to their motivation to learn? Will they be more excited to learn about geography if GPS is involved?

Future studies also demand time and financial commitment from the school community. Students mentioned numerous times in both their surveys and verbally that having more GPS units would help them in completing the activities better as well as learning more about the GPS units themselves. While there are grants and funding available, GPS units are expensive and seen as a luxury item for most schools. Time is also a key consideration when looking at the

incorporation of new activities such as this. Not only do educators need to spend time preparing activities and educating themselves on the use of GPS, they also have to take time out of their traditional curriculum to incorporate these types of activities.

Student Suggestions

In completing the surveys with students the researcher gathered input from them on the activities themselves and offered a chance for them to suggest changes they thought would help them to better complete the GPS activities. One suggestion presented by various students recommended that groups should be given more freedom in determining what cache they wanted to find at any give time. As it was set up, all students in the class were searching for the same cache at the same time, leaving only one group or student to find each of the six caches. In doing it this way the researcher was able to keep better watch of each student to ensure more safety in the woods; however, setting it up this way the researcher inhibited the students who felt little confidence reading the GPS units and searching for the cache to fully involve themselves in the search and have a feeling of success when they found the cache. Having students chose to find the caches in whatever order they decided would create more motivation and feelings of success with finding the caches because each group would have the opportunity to find each of the caches rather than just one group pre cache. However, it would also create a greater safety issue because I would not have the opportunity to keep watch of each of the students.

Another suggestion four students indicated on their survey was to choose a better day in terms of the weather to go outside. These suggestions indicate that the weather conditions have an effect on student learning. If the weather is either too cold or too warm, students would focus more on feeling uncomfortable rather than on the activity. These suggestions need to be taken into consideration especially given the area in which this study took place experiences six or more months of cold temperatures each year and two months of hot/humid weather at the beginning and end of the school year. Therefore times in which these activities take place need to occur during opportune weather conditions.

Benefits for Others

In completing this study the researcher hopes students, teachers, and school administrators will be able to use the information presented in this study to consider starting a GPS incorporation program. This study shows a higher rate of information retention surrounding the five themes of geography when using GPS devices. The use of GPS in the social studies classroom will also take learning to a new level where students will have the opportunity to explore their communities and develop a deeper understanding in order to help them grasp important concepts of other places around the world. This type of hands-on learning will stick with them in the future as it reaches a variety of learning styles including bodily-kinesthetic, visual and auditory.

The incorporation of GPS technology in the social studies classroom will also provide students with the knowledge and skills to work with this expanding

technology in the future. Giving students the exposure to new technology will provide them with a deeper understanding and knowledge base to work with similar or more advanced technology in the years to come.

APPENDIX A

Bibliography

Beeftink, M., & Trzaskus, S. (2007, 2007 Annual Meeting). Connecting Content to Nature Using GPS. *Conference Papers -- North American Association of Environmental Education*, Retrieved November 13, 2008, from Environment Complete database.

<http://ezproxy.hamline.edu:2362/login.aspx?direct=true&db=eih&AN=34716123&site=ehost-live>

Broda, H W, & Baxter, R E (July-August 2003). Using GIS and GPS technology as an instructional tool. *The Social Studies*, 94, 4. p.158(3). Retrieved November 18, 2008, from Academic OneFile via Gale: <http://find.galegroup.com/itx/start.do?prodId=AONE>

Burns, Alvin C., and James W. Gentry. "Motivating students to engage in experiential learning: a tension-to-learn theory." Simulation & Gaming 29.n2 (June 1998): 133(19). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 12 May 2009
<http://find.galegroup.com/itx/start.do?prodId=AONE>

- Butt, Graham. "Is the future secure for geography education?(Author abstract)(Report)." Geography 93.3 (Autumn 2008): 158(8). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 31 Mar. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>
- Cherry, L. (2007, 2007 Annual Meeting). Kids Making a Difference in their Communities: Saving land and mapping using GPS and GIS. *Conference Papers -- North American Association of Environmental Education*, Retrieved November 13, 2008. Environment Complete database.
<http://ezproxy.hamline.edu:2362/login.aspx?direct=true&db=eih&AN=34715726&site=ehost-live>
- Conn, K., & Smith, M. (2006, 2006 Annual Meeting). Keeping Field Science Alive - Citizen Science Solutions. *Conference Papers -- North American Association of Environmental Education*, Retrieved November 13, 2008, from Environment Complete database.
<http://ezproxy.hamline.edu:2362/login.aspx?direct=true&db=eih&AN=26974100&site=ehost-live>
- Crang, M. "Places of practice, and the practice of science." Environment & Planning A 30.11 (Nov 1998): 1971(4). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 30 Mar. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Cych, Leon. "Way ahead of the game." Times Educational Supplement 4588 (June 18, 2004): D20-D21. Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Downs, R.M, Bednarz, S.W. Bjork R.A., Dow P.B., Foote E.F., Gilbert J.F., Gooledge, R.G., Kastens K.A., Leinhardt G., Liben S.L., Linn M.C., Rieser J.J., Stokes G.M., Tversky B., Souza A. Learning to Think Spatially: Geographic Information Systems (GIS) as a Support System in the K-12 Curriculum. National Research Council's Board of the Earth Sciences and Resources of the Division of Earth and Life Studies Committee Report. 2006. Retrived Feb. 14th 2009.
http://dels.nas.edu/dels/rpt_briefs/learning_to_think_spatially_final.pdf

Durham, Helen, and Katherine Arrell. "Introducing new cultural and technological approaches into institutional practice: an experience from geography.(Author abstract)(Report)." British Journal of Educational Technology 38.5 (Sept 2007): 795(10). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Forsyth, Alfred S., Jr. "How we learn place location: bringing theory and practice together." Social Education 52.n7 (Nov-Dec 1988): 500(4). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Fuller, Kevin. "Environmental education.(Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder)(Book review)." The American Biology Teacher 69.4 (April 2007): 247(1). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 31 Mar. 2009. <http://find.galegroup.com/itx/start.do?prodId=AONE>

Gregg, Amy. "Journal assignments for student reflections on outdoor programs.(Report)." JOPERD--The Journal of Physical Education, Recreation & Dance 80.4 (April 2009): 30(10). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 12 May 2009. <http://find.galegroup.com/itx/start.do?prodId=AONE>

Hay, I. (2008, January). Postcolonial Practices for a Global Virtual Group: The Case of the International Network for Learning and Teaching Geography in Higher Education (INLT). *Journal of Geography in Higher Education*, 32(1), 15-32. Retrieved March 30, 2009, doi:10.1080/03098260701728534

Klenow, Carol. "Technology for teaching science." Instructor (1990) 102.n7 (March 1993): 63(2). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009 <http://find.galegroup.com/itx/start.do?prodId=AONE>

Knapp, C. (2009, Winter2009). Resource in Review. *Journal of Environmental Education*, 40(2), 63-64. Retrieved March 31, 2009, from Academic Search Premier database.

Lane, K. (May 2004). The GIST of GPS. *The Science Teacher*, 71, 5. p.32-33. Retrieved November 15, 2008, from Academic OneFile via Gale:
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Lieberman, G. A, & Hoody L. L (1998). Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning. State Education and Environment Roundtable. Retrieved November 19, 2008.
<http://www.seer.org/extras/execsum.pdf>

McLeod, Beth, and Sandy Allen-Craig. "What outcomes are we trying to achieve in our outdoor education programs?(Report)." *Australian Journal of Outdoor Education* 11.2 (July 2007): 41(9). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 12 May 2009
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Minnesota Academic Standards in History and Social Studies. Retrived Feb. 14th, 2009.
<http://www.macalester.edu/geography/mage/resources/publications/4-8.pdf>

Nagel, P. (2008, November). Geography: The Essential Skill for the 21st Century. *Social Education*, 72(7), 354-358. Retrieved March 30, 2009, from Academic Search Premier database.

Pidot, Lauren. "High-tech hide & seek." New York State Conservationist 59.4 (Feb 2005): 10(3). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Schlatter, B. E., & Hurd, A R (Sept 2005). Geocaching: 21st-century hide-and-seek. This high-tech form of orienteering offers physical educators abundant opportunities for multidisciplinary lessons. *JOPERD--The Journal of Physical Education, Recreation & Dance*, 76, 7. p.28(5). Retrieved November 17, 2008, from Academic OneFile via Gale: <http://find.galegroup.com/itx/start.do?prodId=AONE>

"Spending time with nature reduces ADHD symptoms, study shows.(MIND NEWS)(attention deficit hyperactivity disorder)(Report)." Annals of the American Psychotherapy Association 11.4 (Winter 2008): 6(1). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 7 Feb. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Swiderski, M. (2006, July). Nature Deficit Disorder: Plugged In and Out of Touch. *Journal of Experiential Education*, 29(1), 95-97. Retrieved March 31, 2009, from Academic Search Premier database.

Taylor, A F., Kuo, F.E., Sullivan W.C. "Coping with ADD: The Surprising Connection to Green Play Settings." ENVIRONMENT AND BEHAVIOR, Vol. 33 No. 1, January 2001 54-77 © 2001 Sage Publications, Inc. 7 Feb. 2009.
http://www.cbf.org/site/DocServer/Coping_with_ADD.pdf?docID=13323

Todd, Reese H., and Tina Delahunty. "'A' Is for Aerial Maps and Art.(Report)." Social Studies and the Young Learner (Annual 2007): NA. Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Zeigler, D. (2007, Spring2007). TEACHING GEOGRAPHY IN AN INTERCONNECTED WORLD. *Independent School*, 66(3), 94-97. Retrieved March 30, 2009, from Academic Search Premier database.

APPENDIX B

**Big Woods Field Trip
Authorization Form**

During 3rd and 4th quarter Ms. Messick’s 7th grade geography class will have the opportunity to go on various field trips to the “Big Woods” (the woodland area across the street from STMA Middle School). On these field trips students will make observations along with learning GPS navigation and mapping skills. The field trips will be during class time. Students are required to follow all safety rules and guidelines as well as wear appropriate clothing for the weather. The students will be supervised by an instructor at all times. Please sign and date below to authorize your student to attend these field trips.

I authorize the St. Michael –Albertville School District to allow my child,
_____, to accompany his/her class on various local field trips as described above.

Date _____ Parent Signature _____

** Note: Throughout the course of these field trips/activities students will be **anonymously** observed and surveyed so I can collect information to write my capstone paper. In completing this final study I will graduate with a Master’s Degree from the School of Environmental Education and Natural Science at Hamline University. I’m very excited about the opportunity to incorporate GPS navigation and mapping into my curriculum and thank you for your support. Please contact me brianne@stma.k12.mn.us if you have any questions.

APPENDIX C

Pre-Survey

Please answer these questions as honestly as you can! Most questions will be asked base on a scale from 1-4 (1 being the least and 4 being the most):

1 = not at all 2 = not very well/much 3= somewhat 4 = very well/much

1. On a scale from 1-4 how well can you identify the absolute location of a place?
2. On a scale from 1-4 how well can you describe the relative location of a place?
3. On a scale from 1-4 how comfortable are you in describing human characteristics of a place (in other words what are the people like)?
4. On a scale from 1-4 how comfortable are you in describing the physical characteristics of a place (what are the landscape and physical features like)?
5. On a scale from 1-4 how good are you at determining spatial distance. In other words if I were to ask to tell me the distance from the school building to the entrance of the Big Woods how accurate do you think you would be?
6. On a scale from 1-4 how good are you at identifying the human-environment interactions that occur in a place?
7. On a scale from 1-4 how well can you at identifying the movement of people in a place?
8. On a scale from 1-4 how well can you identify the movement of things in a place?
9. On a scale from 1-4 how well can you identify the movement of ideas in a place?
10. On a scale from 1-4 how good are you at picking out similarities places have with one another and creating a region?
11. Have you ever used a GPS (Global Positioning System)? Yes No
12. On a scale from 1-4 how interested are you in learning more about GPS (4 being very interested 1 being not at all)?
13. I learn best in the classroom. Yes No
14. I learn best in the outdoors. Yes No
15. On an average weekday, how many hours do you use media devices (talking on the phone, watching television, using the computer, listening to the radio, I-pod etc.) outside of school?
 - A. 1-2 hours
 - B. 2-3 hours
 - C. 3-4 hours
 - D. 4 + hours
16. On an average weekday, how many hours do you spend outside?
 - A. 1-2 hours
 - B. 2-3 hours
 - C. 3-4 hours
 - D. 4 + hours
17. Do you prefer spending more time inside using media devises or outdoors?
 - A. Indoors
 - B. Outdoors

Post Survey

Please answer these questions as honestly as you can! Most questions will be asked base on a scale from 1-4 (1 being the least and 4 being the most):

1 = not at all 2 = not very well/much 3= somewhat 4 = very well/much

1. On a scale from 1-4 how well can you identify the absolute location of a place?
2. On a scale from 1-4 how well can you describe the relative location of a place?
3. On a scale from 1-4 how comfortable are you in describing human characteristics of a place (in other words what are the people like)?
4. On a scale from 1-4 how comfortable are you in describing the physical characteristics of a place (what are the landscape and physical features like)?
5. On a scale from 1-4 how good are you at determining spatial distance. In other words if I were to ask to tell me the distance from the school building to the entrance of the Big Woods how accurate do you think you would be?
6. On a scale from 1-4 how good are you at identifying the human-environment interactions that occur in a place?
7. On a scale from 1-4 how well can you at identifying the movement of people in a place?
8. On a scale from 1-4 how well can you identify the movement of things in a place?
9. On a scale from 1-4 how well can you identify the movement of ideas in a place?
10. On a scale from 1-4 how good are you at picking out similarities places have with one another and creating a region?
11. Have you ever used a GPS (Global Positioning System)? Yes No
12. On a scale from 1-4 how interested are you in learning more about GPS (4 being very interested 1 being not at all)?
13. I learn best in the classroom. Yes No
14. I learn best in the outdoors. Yes No
15. On an average weekday, how many hours do you use media devices (talking on the phone, watching television, using the computer, listening to the radio, I-pod etc.) outside of school?
 - A. 1-2 hours
 - B. 2-3 hours
 - C. 3-4 hours
 - D. 4 + hours
16. On an average weekday, how many hours do you spend outside?
 - A. 1-2 hours
 - B. 2-3 hours
 - C. 3-4 hours
 - D. 4 + hours
17. Do you prefer spending more time inside using media devises or outdoors?
 - A. Indoors

Geocaching Post Survey Continued

Directions: Please answer the following questions as honestly as you can.

1- Not at all 2- Somewhat 3- A lot 4- Very Much

1. On a scale from 1-4 how much did you enjoy completing the 5-themes GPS activity?
2. On a scale from 1-4 how much do you think it helped you to understand the 5-themes?
3. On a scale from 1-4 how much would you like to do an activity using the GPS systems again?
4. Please write any other comments you have about the activity.
5. Are there any other suggestions you have for the GPS activity?

APPENDIX D

Five Themes Geocaching Worksheet

Directions: In your groups you will use your GPS units to find each geocache hidden in the Big Woods. Once found, you need to read the directions and answer the following questions after reaching each cache. The first group to find each cache will be given an extra bonus points added to their final score as well as keep the prize. Also the groups with the best explained answers will also be awarded bonus based on the quality of their answers, so think and search hard!!

Jobs: Each member of the team will have a specific job while on the hunt. While each member will be responsible for a certain aspect of the activity, all members are responsible for thinking of answers to the questions!

Recorder: This person will be in charge of writing the groups responses and holding on to the clipboard and all clues the group finds.

Seeker and Reader: This person will be primarily in charge of finding the cache and reading the clues/questions. This person should show great communication skills, follow directions well and listening to the group members. This person will also be in charge of carrying and operating the handheld compass.

Tech Expert: This person will be in charge of operating the GPS unit and communicating with the group where they think the cache is hidden.

Task Manager: This person will assist the Tech Expert and will hang on to the GPS instructions. They will also make sure each member of the group is present at all times and working together. They will also assist the recorder in editing each response.

Before leaving to go to the Big Woods come up with an estimate for how far you think it is to travel from just outside the school doors, around the big woods trail and back to school? _____.

Cache #1: Place

Cache # 2: Location

Absolute: _____ Latitude _____
Longitude _____

Relative Location (hint use the compass page on the GPS to help you in describing)

Cache #3: Human Environment Interaction

Cache #4: Movement

Cache #5: Region

When back at school, look at the trip information page and write down how far you and your group members walked while doing this activity.

APPENDIX E

Questions in Geocaches

Place Cache

Congratulations! You have found cache #1 Place. Make sure you follow the directions very carefully as you fill out your worksheet!

Directions: Take a slow 360 degree turn and observe everything around you. Then in 2 to 3 sentences, describe the Place of this area of St. Michael on your worksheet. In other words describe some of both the human and physical characteristics of this particular place.

Location Cache

Congratulations! You have found Cache #2 Location. Please read the directions carefully from your tech sheet and fill out your answers on the worksheet.

Part A: Using your GPS unit follow the directions on the tech sheet to mark your current Absolute location (exact location) and write then on your worksheet.

Part B: Using your compass page or the hand held compass describe your relative location to everything around you. (For example: Cache #2 is West of the swamp or North of Naber Ave etc.) Make sure you use all 4 coordinates!

Human-Environment Interaction Cache

Congratulations! You have found Cache #3 the Human Environment Interaction Cache. Read the directions carefully and explain your answers on the worksheet!

Directions: Take a look at the area around you and what you have seen so far today in the Big Woods. Describe 2 ways humans have changed

the environment and 2 ways the environment has changed the people that live in this area or even you right now.

Movement Cache

Congratulations! You have found Cache #4, Movement. Read the directions carefully and fully explain your answers on the worksheet!

Directions: Looking at the area around you, how are ways that people, goods and ideas are exchanged? Name at least one way for each of the 3 types of movement!

Region Cache

Congratulations! You have found your final cache on this 5 themes mission! As always, read the directions carefully and explain your answers with detail!

Directions: Now that you have seen that area of the Big Woods and its surroundings, what are some of the characteristics that you think are similar of other places. Come up with one region to fit the Big Woods and surrounding area into and describe 3 detailed reasons why you placed it in the region you did. (Hint! Look at what you wrote for the other themes, are there things this place shares in common with other places you have been?)

Think hard... there can be numerous options!

REFERENCES

Adam, Anna, and Helen Mowers. "Can you dig it? A high-tech twist on the treasure hunt, geocaching is a fun way to take learning outdoors.(treasure hunt-like method of teaching)." School Library Journal 53.8 (August 2007): 40(3). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Backler, Alan, Joseph Stoltman. "The Nature of Geographic Literacy. ERIC Digest No. 35" November, 1986. Retrieved June 6, 2009 from
<http://www.ericigests.org/pre-925/nature.htm>

Baker, T R (Dec 2001). Success with GPS. *The Science Teacher*, 68, 9. p.38(4). Retrieved November 15, 2008, from Academic OneFile via Gale: <http://find.galegroup.com/itx/start.do?prodId=AONE>

Boehm, Richard G., and James F. Petersen. "An elaboration of the fundamental themes in geography." Social Education 58.n4 (April-May 1994): 211(3). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Brooks, C. (2006, October). Geographical Knowledge and Teaching Geography. *International Research in Geographical & Environmental Education*, 15(4), 353-369. Retrieved March 30, 2009, doi:10.2167/irg200.0.

Cleary, Pete. "Last Author in the Nostalgic Past; Curing 'Back in my Day Disorder.'" *The Interpreter; a Resource for Heritage Interpreters*. September/October 2008, pg 14-15. Retrieved April 18th, 2009.

Cresswell, Tim. "Place: encountering geography as philosophy.(Author abstract)." *Geography* 93.3 (Autumn 2008): 132(8). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009 <http://find.galegroup.com/itx/start.do?prodId=AONE>

Ekiss, G. O., Trapido-Lurie, B., Phillips, J., & Hinde, E. (Annual 2007). The World in Spatial Terms: Mapmaking and Map Reading.(Report). *Social Studies and the Young Learner*, p.NA. Retrieved November 22, 2008, from Academic OneFile via Gale: <http://find.galegroup.com/itx/start.do?prodId=AONE>

Groundspeak. Geocaching. Retrieved February 28th, 2009 from www.geocaching.com

Golledge, Reginald G., Meredith Marsh, and Sarah Battersby. "Matching Geospatial Concepts with Geographic Educational Needs.(Author abstract)(Report)." Geographical Research 46.1 (March 2008): 85(14). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 31 Mar. 2009
<http://find.galegroup.com/itx/start.do?prodId=AONE>

GPS. (2009). In *Merriam-Webster Online Dictionary*. Retrieved February 28, 2009, from <http://www.merriam-webster.com/dictionary/GPS>.

Hill, A. David. "Rediscovering geography: its five fundamental themes." NASSP Bulletin 73.n521 (Dec 1989): 1(5). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Joseph, Linda C. "Caching in on GPS: build a foundation of knowledge with latitude and longitude concepts. Then, read about GPS and tap into some great lessons." Multimedia & Internet@Schools 13.6 (Nov-Dec 2006): 21(5). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 31 Mar. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Kirkorian, Heather L., Ellen A. Wartella, and Daniel R. Anderson. "Media and young children's learning." The Future of Children 18.1 (Spring 2008): 39(23). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 28 Feb. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Louv, Richard (2008). *Last Child in the Woods: Saving our Children from Nature-Deficit Disorder*. Algonquin Books of Chapel Hill.

McInerney, Malcolm. "The Case for Spatial Literacy." Retrieved Feb. 16th, 2009.
<http://malcolm.mcinerney.googlepages.com/THECASEFORSPATIALLITERACY.doc>

Meyer, Judith W., Jon Butterick, Michael Olkin, and George Zack. "GIS in the K-12 Curriculum: A Cautionary Note(*)." The Professional Geographer 51.4 (Nov 1999): 571. Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Morgan, John. "Curriculum Development in 'New Times'. (Geography Curriculum)(Essay)." Geography 93.1 (Spring 2008): 17(8). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

Scott Curwood, Jen. "Generation IM: getting through to today's teched-out children. (instant messaging) (cover story)." *Instructor* (1990) 118.1 (August 2008): 34(5) Academic OneFile. Gale. Hamline University – Bush Library-CLIC. 26 Jan. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>.

Senteo Assessment Software. (1995-2008). [Computer Software]. Calgary, AB Canada: SMART Technologies, Inc.

Sternberg, Rolf. "Geography and the student." Geography 89.3 (Oct 2004): 287(5). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 25 Jan. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>

The American Heritage® Dictionary of the English Language, Fourth Edition
copyright ©2000 by Houghton Mifflin Company. Updated in 2003.
Published by Houghton Mifflin Company.

Wikle, Thomas A (2000). Global Positioning System and Education in the 21st Century. *Environmental Education and Information*, 19, 1. pg.37-54.
Retrieved November 20, 2008.

Worrell, Chris. "Nostalgia for a better future: a response to Pete Cleary's Critique of Last Child in the Woods by Richard Louv.(COMMENTARY)(Last Child in the Woods: Saving Our Children From Nature-Deficit Disorder)(Critical essay)." Legacy Magazine 20.1 (Jan-Feb 2009): 38(4). Academic OneFile. Gale. Hamline University - Bush Library-CLIC. 31 Mar. 2009.
<http://find.galegroup.com/itx/start.do?prodId=AONE>