HOW INCORPORATING OUTDOOR EDUCATIONAL EXPERIENCES IMPACT AND BENEFIT 7TH GRADE STUDENTS IN SCIENCE EDUCATION

by

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of

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ABSTRACT

This investigation looked at how incorporating outdoor educational experiences impacted and benefited 7th grade students in science education. Students participated in seven outdoor experiences total, including two full-day field days and five outdoor class sessions. Students were interviewed and surveyed so that data could be collected before and after the outdoor experiences. In addition, students' behavior and attitudes were observed during the outdoor experiences. The students were also asked to recall information about the two field days to examine their retention of relevant information. Additional data was collected on the use of electronics by students, and how it impacted their time outdoors. Results revealed that students' attitudes about outdoor learning were better than their attitudes toward learning in the classroom. The majority of students rated their behavior as good to great during each outdoor class session. Students often reflected that they were more on task in an outdoor setting than in an indoor learning environment. Students agreed that electronics sometimes kept them from being outdoors. Increased credit was given to teachers or schools and to students educating themselves in regard to who taught them the most about nature and the outdoors. Overall, the data indicated outdoor experiences had a positive impact on students' time on task, attitudes, and motivation toward learning science.

INTRODUCTION AND BACKGROUND

For the past six years, I have taught seventh grade life science at Hamilton Middle School (HMS) in Hamilton, Montana. Combined, I have a total of 12 years of teaching experience with 11 years at the middle school and 1 year at the high school level. Currently, I teach 5 seventh grade classes with a total of 113 students, 61 boys and 52 girls of mixed ethnic backgrounds. Of the seventh grade class, 89.3% are Caucasian, 7.1% are Latino, 1.0% are Asian, and 2.6% are African America. Out of the 113 seventh graders, 44% qualify for free and reduced lunch (Infinite Campus, 2015). The seventh grade makes up approximately a third of the HMS population, which currently has 304 students enrolled. The students interact in many different peer groups and cliques ranging from socioeconomic to sports related groups. A majority of students view HMS as "a welcoming and friendly place" and believe "what they learn in school will benefit [their] future" (Pearson Foundation, 2012). HMS is located in Hamilton, a small town in the Bitterroot Valley of Western Montana. It is one of five schools in Hamilton School District #3. While the town of Hamilton has a population of 4,348 people, there are actually 13,052 people who live within the district boundaries (MapTechnica, 2014).

Being a life science teacher, I strongly believe students interacting with nature is important. I cannot think of a better way to foster knowledge concerning these interactions than having students experience nature directly by letting them use multiple senses to experience potential interactions that are taking place. Often, a traditional learning classroom only has students use their senses of sight and sound. While some indoor laboratory activities allow use of additional senses, they usually do not engage as

many senses as when students are in a real-life outdoor setting. Interacting with the natural environment stimulates the use of multiple senses (Louv, 2008).

Over the course of my career, I have noticed an increase in media accessibility and use among middle school students. Technology use has its benefits, but I believe it comes at the cost of detachment from the natural, outdoor world. Like a traditional classroom setting, media use also focuses on using only the senses of sight and sound, while neglecting the other senses. I want my students to be able to find a balance between media use and engagement in nature, both at school and in their lives.

During this time, I have also witnessed an increased number of obstacles and constraints when it comes to being able to arrange outdoor learning experiences. Budget shortfalls have decreased funding for field trip transportation. Teaching and paraprofessional positions have been cut which increases student class sizes (Hamilton Public School District, 2014). Having additional students in each class makes the management of outdoor events more challenging. Scheduling an outdoor experience lasting longer than a regular class period requires a consensus from all staff members involved and requires willingness for those teachers to give up their class time. With an increased focus on assessment, sometimes teachers feel pressured to cover as much content material as possible and are not always willing or able to allow students to miss the allotted time for their subject. With budget shortfalls, scheduling, and increased focus on assessment, it seems students are spending less and less time learning outside the classroom. Even with all of these obstacles, it is my belief learning outside the classroom is beneficial and ways should be found to work around the obstacles.

Wanting to see the benefits of increased outdoor educational opportunities led to the creation of my focus statement: *How does outdoor education impact and benefit seventh grade students in science education?* In addition, the following sub-questions were researched.

1. How does the use of outdoor education affect students' attitudes, time on task, and motivation toward learning science?
2. How does the use of outdoor learning enhance students' recall of information?
3. How does increased outdoor educational exposure affect students' lifestyles, perceptions, and interactions with nature?

CONCEPTUAL FRAMEWORK

Nature has played an important role in the evolution of humans. From an early age, children learn from experiencing their surroundings (Louv, 2007). Through play in outdoor environments, children develop skills and learn to use their senses. The natural world is a place to develop and hone all of one's senses and learn by doing. The smells, sights, sounds, tastes, and feel of nature excites the senses and have the power to shape the psyche (Louv, 2008).

Outdoor education is one way for students to make lasting relationships with nature. It allows them to apply and transfer knowledge gained in the classroom and solidify their understandings of the natural world. These reasons give justification for using outdoor experiences for educational purposes, even when barriers exist (Jordan & Nadelson, 2012). Children today experience nature differently from children a few decades ago. They do not know the local woods, but can tell a person about the

rainforest (Louv, 2008). While students become more aware of global issues via media and within the classroom, their immersion into nature is fading (Louv, 2007).

According to Louv (2008), exposure to nature is essential for emotional and physical health and it can influence children's cognitive abilities and help fight stress and depression. He further states that direct experiences in nature allow one to develop the skills necessary for solving problems. Being outdoors offers fewer industrial distractions, less confinement, and more openness to explore, encounter new vocabulary, be creative, move, and problem solve with others while utilizing social and academic language skills (Learning through Landscapes, 2009). Children who spend time in nature are less likely to develop diabetes, are more likely to use creativity to develop their own games, and tend to be more cooperative (Louv, 2007).

With outdoor time and outdoor learning on the decline, many children are no longer comfortable spending time in nature (Coyle & National Wildlife Federation [NWF], 2010). As kids spend less time outdoors, their physical, psychological, and cognitive functions are threatened (Louv, 2007). Increased exposure to outdoor experiences can help children concentrate and communicate better with peers and adults (Coyle & NWF, 2010). Fewer children are learning to swim, bike, and spend time outside due to competition with electronic devices combined with fear from parents about the safety of their children (Louv, 2007).

With electronic media and its ease of use, parents and children are turning to such sources for instant gratification and information. Twenty-four hour access to news stories has heightened parental concerns for children playing unsupervised outdoors. This has caused some parents to have distorted fears about strangers, traffic accidents, and

injuries and prefer their children be indoors or supervised at all times while outdoors (Howard, 2012). These fears may not always be warranted. Statistics show most child-related crimes, including abduction by strangers, have continued to decrease over the past decade (Finkelhor, 2013). Parents are also overcautious when wanting to prevent possible injuries (Coyle & NWF, 2010). Incidentally, outdoor injury rates involving children have been on the decline while indoor injuries among children, some related to the overuse of electronics, are on the rise (Levy, 2013). Parental overprotection has led to children not experiencing or exploring the world around them. Often, today's child is moved from a highchair, pushed in a stroller, and then placed in a car seat. This is producing a group of containerized kids with few ties to the outdoors. Children are not allowed to roam their neighborhoods anymore due to stricter covenants, ordinances, policies, and fears. They are no longer using all of their senses to explore the outdoors. Sight and sound become the only senses utilized when the world is viewed from in front of a screen (Louv, 2008).

The overuse of technology has created a cohort of children that have no sense of belonging to nature (Louv, 2008). Today's children in third grade through high school are consuming on average approximately 52 hours of media time per week (Foehr, Rideout, & Roberts, 2010). Technology is connected to every part of their lives, but does not allow them to use all of their senses to interact with the natural world or experience it directly (Louv, 2008). Children who spend a greater amount of time on electronic devices are reported to have lower grades and are often less content as individuals (Foehr et al., 2010). Electronic media is a part of modern society, but it needs to be balanced with play and educational time spent outdoors (Coyle & NWF, 2010). One cannot get all

of his or her experiences from a computer. Learning comes from doing, touching, and feeling (Louv, 2008).

The educational potential for students learning outside the classroom is high (Association for Science Education Outdoor Science Working Group [ASE OSWG], 2011). Outdoor education benefits children in a variety of ways. It helps children with their understanding, communication skills, motivation, and enthusiasm toward learning. Environmental and outdoor education has a clear connection to the real world. Therefore, it makes education and places where education happens more interesting and engaging (Coyle & NWF, 2010). Being outdoors decreases student stress levels and increases students' ability to focus (Louv, 2007). Outdoor learning gives students the opportunity to connect and reinforce the teachings learned in the classroom (Lakin, 2006). It allows students to use all of their senses and gives them a chance to apply what they have learned. Solid outdoor educational programs develop real world skills and foster the use of students' imaginations (Coyle & NWF, 2010). Studies have shown the use of outdoor classrooms, fieldwork, and scientific labs have all increased students' test scores and how they feel about themselves and their desire to learn (ASE OSWG, 2011; Louv, 2007).

The outdoor learning experience is something that cannot be replicated in the classroom (Jordan & Nadelson, 2012). Pieces of nature could be brought in to the classroom, but the act of being in the realm, experiencing a part of the environment, caring for it, and learning about it creates a better connection. The physical and emotional links created by learning surrounded by the outdoor environment can create interest that can lead to real science exploration of the world (Lakin, 2006).

There are two common methods to getting students out of the classroom. The first learning experience is to bring students to a learning center, like a museum or a science center. The second is more informal. It exposes students to the outdoors by visiting a park, preserve, local forest, or another location suitable for outdoor learning. The learning outcomes in the second type of field trip can be more unpredictable than the well-established learning centers. Field trips can be very useful educational tools used to enhance students' knowledge (Jordan & Nadelson, 2012).

In light of the benefits of getting students outdoors, barriers can exist for this type of learning, such as difficulties with funding, scheduling, and time for teacher and student preparation (Rogers & Smith, 2012). Finding ways to overcome the barriers and increase teachers' knowledge can increase the success for this type of educational opportunity. Strengthening initial teacher training in the classroom and building professional development around outdoor education helps improve the quality of the outdoor experience (ASE OSWG, 2011; Louv, 2007). Developing support systems in which teachers and other professionals collaborate to make the field experience run smoothly and fit students' needs will also make for successful field experiences (ASE OSWG, 2011). The value of thorough preparation and planning is critical. The teacher needs to be involved with the majority of the planning process and needs to have learning targets for students (Lakin, 2006).

Teachers also need to maximize outdoor learning by tying classroom knowledge to learning in the outdoors (Lakin, 2006). This can be done with open-ended assessments, which can increase in-depth learning and should be used to measure the outcomes of a field experience (ASE OSWG, 2011). Pre-teaching learning strategies

specific to the event can help students to be successful during the field experience. In preparing for an outdoor event, teachers must also understand certain issues with health, safety, and data collection may be beyond one's control (Lakin, 2006).

Getting students out into nature has benefits that outweigh the possibility of having a world disconnected from nature. Outdoor education develops skills students will use their entire lives (Coyle & NWF, 2010). When parents and schools advocate for students to spend more time in nature and less time with media use, they are creating future stewards of the land and may ultimately help students determine their future field of study (Louv, 2007). Outdoor education opportunities will help schools create healthier and better educated students with deep seated life skills (Coyle & NWF, 2010).

METHODOLOGY

The purpose of this study was to determine if outdoor education experiences positively impacted and benefited students in science education. The treatment consisted of five outdoor class sessions and two full-day field ecology experiences. The treatment occurred with all seventh grade life science students at Hamilton Middle School (N = 113). Prior to the treatment, a grant was secured to fund bus transportation and necessary equipment, such as cameras, waders, and snowshoes. All of the outdoor experiences allowed students to get out of the classroom where they worked on curriculum related tasks while observing the natural world. The outdoor class sessions occurred during each 50-minute life science class on designated outdoor class days throughout September, October, and January.

The two full-day field ecology experiences included students rotating through presentations on a variety of topics. Teacher preparation for both field days began

approximately two months in advance of each experience. Preparation required coordinating a date and location that would work for students and teachers at HMS, as well as outside agencies and volunteers. Once the date and location were finalized, topics of stations were tentatively determined, presenters were contacted, and materials were located and reserved. Some presenters who originally offered to volunteer ended up being unavailable on the set dates, so new volunteers had to be found and in some cases, topics had to be reworked prior to the arrival of each field day. Another task involved dividing students into groups based on the dynamics and special needs of some students and based on the chaperones available to assist with each group. Preparation also required remaining in contact with all involved with the field day, including families of students, to ensure everyone arrived on time with the proper equipment and gear.

The Water Ecology field day occurred October 2, 2014 at River Park near the Bitterroot River in Hamilton, Montana (Appendix A). The Winter Ecology field day occurred February 3, 2015 at Lost Trail Powder Mountain ski area located on the Continental Divide of the Montana-Idaho border in the Bitterroot Range of the Rocky Mountains (Appendix B). Overall, students were able to participate in seven outdoor experiences for the treatment period (Table 1).

Table 1
Treatment Schedule

Experience	Activity/Stations	Location	Time	Date
Outdoor Class Session #1: Five Senses	Outdoor Observations, Speed of Sound	Hamilton River Park	50 minutes	Sept. 24, 2014
Field Day #1: Water Ecology	-Fly fishing guide -Fishing -Macroinvertebrates -Riparian area -Search & Rescue -Fisheries biologist -Invasive species -Water pollution & uses	Bitterroot River, Hamilton River Park	6 hours, 20 minutes (plus 30 minutes traveling time)	Oct. 2, 2014
Outdoor Class Session #2: Macroinvertebrates	Pollution Tolerance Index (PTI)	Bitterroot River, Hamilton River Park	50 minutes	Oct. 9, 2014
Outdoor Class Session #3: Metric Mania	Metric Conversion Scavenger Hunt	HMS grounds	50 minutes	Oct. 14, 2014
Outdoor Class Session #4: Tree Identification	Field Guide Use	Walked around neighborhoods west of HMS	50 minutes	Oct. 31, 2014
Outdoor Class Session #5: Photosynthesis	Photosynthesis in Winter	Walked from HMS to Hamilton River Park and back	50 minutes	Jan. 27, 2015
Field Day #2: Winter Ecology	-Avalanche Safety -Wildlife Winter Adaptations/Trapping -Geocaching -Winter Survival -Snowshoeing -Snow Course -Sledding -Native American Stories/Games	Lost Trail Powder Mountain ski area	6 hour, 30 minutes (plus 2 hours traveling time)	Feb. 3, 2015

Students' attitudes, long-term recall of concepts presented, and time on task were analyzed during this treatment period. The research methodology for this project received an exemption by Montana State University's Institutional Review Board and compliance for working with human subjects was maintained (Appendix C).

Before any outdoor experiences took place, all students completed the Pre-Outdoor Education Impact Survey (Appendix D). At the end of the treatment period, the information from the Pre-Outdoor Education Impact Survey was compared to the Post-Outdoor Education Impact Survey (Appendix D). The information collected was compared for themes and assessed to see how students felt before the first outdoor experience compared to the last outdoor experience. The Outdoor Education Impact Survey was designed to determine how students felt about being outdoors and if they thought outdoor education experiences were beneficial. It also looked at whether or not students believed electronic devices impeded the time they spent outdoors.

The Pre-Treatment Student Interview Questions was administered to 22 randomly selected students (Appendix E). Four to five students were interviewed from each of the five classes. The same students participated in the Post-Treatment Student Interview Questions. The Pre-Treatment Student Interview Questions allowed students to give information on how they felt about spending time outdoors and what they liked to do while outside. One question asked students to recall prior outdoor educational experiences that occurred in a school environment. The Pre- and Post-Treatment Student Interview data was assessed for themes and used to support evidence collected from other research tools.

Prior to beginning any field experiences, students completed the Pre-Treatment Activity Diary to measure the amount of time spent outdoors in comparison to other activities, like doing homework, playing video games, watching television, and playing other electronic devices (Appendix F). Once all outdoor experiences were complete, students were given the Post-Treatment Activity Diary. The pre- and post-treatment

diaries were compared and assessed to see the rate students were staying inside using electronics compared to the rate of time spent outdoors. The information gathered was then compared to see if students' daily activities changed after being exposed to outdoor educational experiences at school.

The Parent Survey was sent home to allow parents to give their point of view on their child's outdoor activities and what their student's daily activities looked like (Appendix G). Parent data was matched with child data to see how views compared.

The Pre-Student Nature Survey was administered prior to any outdoor experiences and used to help determine students' attitudes toward nature (Appendix H). This survey determined how students felt about spending time in the outdoors. Students completed the Post-Student Nature Survey after the last field day experience. Pre- and post-surveys were compared to see what percentage of student's feelings had changed.

In order to test the effects of outdoor experiences on students' attitudes, time on task, and motivation toward learning science, students were given a Pre- and Post-Science Attitude Survey (Appendix I). The Science Attitude Survey provided information about how students felt about science. The pre- and post-surveys were compared to see if students' attitudes changed after being exposed to outdoor experiences in science. The information from the pre- and post-surveys was used to look at trends in students' attitudes looking at what percentages of students' attitudes changed and why they changed.

The Anonymous Behavior Self-Assessment was given to students following each outdoor experience (Appendix J). This was used to let students reflect on their time on task and participation in the daily activities. Students also kept a journal for each outing.

The Science Notebook Formatting Prompts gave students a chance to reflect on what they did each day, along with how they felt while participating in the outdoor activity (Appendix K). For each 50-minute outdoor classroom session, students were also asked to reply to a modified version of Angelo and Cross's (1993) One Minute Paper, to answer the following question, "What was the most important thing you learned during your field experience and what questions have remained unanswered?" The students used their journals to record observations and answer questions related to that day's classroom session. Journal entries were analyzed and compared to the Anonymous Behavior Self-Assessment results for each experience. This information was inspected for trends and used as evidence of students' feelings toward outdoor experiences. It was also compared to other outdoor data collection tools, as well as teacher observations.

In addition to student journaling, teacher observations were used to evaluate how students felt about the activities in which they participated. Field notes included the date, behavioral observations, weather conditions, student comments during the experience, and other related observations. Instructor field observations were compared to student journal observations and the Anonymous Behavior Self-Assessments to see if teacher observations matched that of the students. This information was also used to support evidence from other outdoor data collection tools.

Students' ability to retain and recall information learned during their full length field days was tested for both short term and long term recall. The students were given the Post-Student Assessment for Field Days (Appendix L). The Post-Student Assessments for Field Days were initially administered the day after each field day to show what students recalled from the previous day. Each student drew an image of the

station that he or she remembered the most and then summarized the other stations. Frequencies of recalled stations and information were calculated.

Students were given the Post-Student Delayed Assessment for Field Days two weeks after each of the two field experiences to test students' long term retention (Appendix M). The Post-Student Assessment for Field Days was formatted the same as the Post-Student Delayed Assessment for Field Days in that it asked students to recall information both to summarize each station and illustrate the most memorable station. Percentage of recall was compared between each post and two week delayed assessment.

A random selection of 25 students was given the Post-Student Interview Questions for Field Days in order to obtain recalled information regarding the activities of each field day and students' views of each field day (Appendix N). Students were given the opportunity to express how they felt about each field day and what they felt would make the field days better. This post-student interview data for the field days was assessed for themes and used as supporting evidence for observations and other data that was collected. With multiple outdoor experiences, a variety of data collection methods were used (Table 2).

Table 2
Data Triangulation Matrix

Research Question	Data Source 1	Data Source 2	Data Source 3
Primary Question: How does outdoor education impact and benefit seventh grade students in science education?	Pre- & Post-Outdoor Education Impact Survey	Pre- & Post-Treatment Student Interviews Questions	Instructor Field Observations
Secondary Questions: How does the use of outdoor education affect students' attitudes, time on task, and motivation toward learning science?	Student Journals: Science Notebook Format Prompts	Pre- & Post-Science Attitude Survey	Anonymous Behavioral Self-Assessments (following each field experience)
How does the use of outdoor learning enhance students' recall of information?	Post-Student Assessment for Field Days and (2 Week) Post-Student Delayed Assessment for Field Days (to complete after each of the two full-length field days)	Post-Student Interviews Questions for Field Day (to complete after each of the two full-length field days)	Student Journals: Modified "Minute Paper" CAT #6 (to complete after each outdoor class session): *"What was the most important thing you learned during the field experience?" "What important question remains unanswered?"*
How does increased outdoor educational exposure affect students' lifestyles, perceptions, and interactions with nature?	Pre- and Post-Treatment Activity Diary (one weekday/one weekend day)	Parent Survey, is a survey about child's experiences (Pre-treatment)	Pre- and Post-Student Nature Survey (Pre- and Post- Treatment)

DATA AND ANALYSIS

When students were asked if they felt comfortable spending time outdoors before the treatment period, five percent of the students said they felt uncomfortable being in the outdoors (n=102). One student said, "I'm uncomfortable. It's just not my thing." Another cited being uncomfortable because of the bugs. After the treatment period, two percent of the students said they were uncomfortable being outdoors. When asked what

students disliked when they were outside, answers varied from bugs to birds, to wet grass, to being too hot or too cold, and having no Wi-Fi.

Using the Pre-Outdoor Education Impact Survey, students were asked how many hours they spent outdoors or on electronics on average, outside of school. Prior to the treatment, students on average indicated that they spent 3.35 hours outdoors and 3.26 hours on electronics (*n*=98). After the outdoor experiences, students were given the Post-Outdoor Education Survey. After the treatment period, students said they spent 2.73 hours outdoors and 2.92 hours on electronics per day (Figure 1).

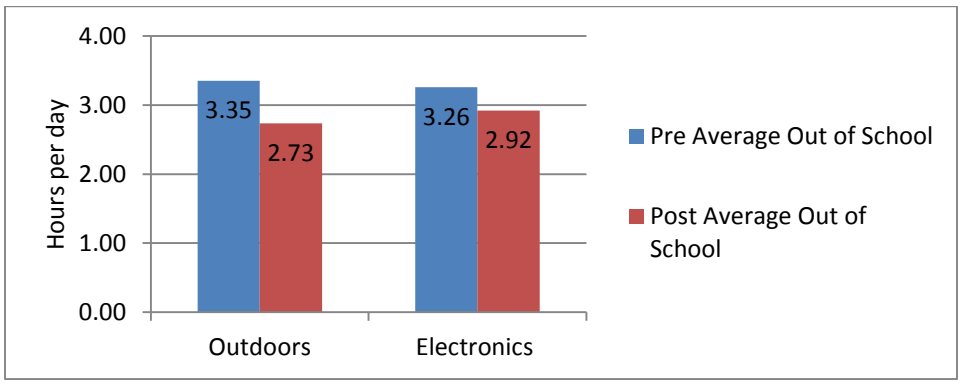


Figure 1. Average time students spent outdoors and on electronics, (*n*=98).

In addition to estimating how many hours were spent outdoors or using electronics, 38 students completed both Pre- and Post-Treatment Activity Diaries for one weekday and one weekend day. Of the students who completed the Pre-Treatment Activity Diary, 58% spent more time outdoors than on electronics. The average time spent outdoors, outside of school, was 1.08 hours per weekday and 2.97 hours per weekend day. The average time spent using electronics (e.g., media) outside of school was 1.01 hours per weekday and 2.24 hours per weekend day. During the Post-Treatment Activity Diary, the number dropped to 29% of the students spending more

time outdoors than on electronics. With the Post-Treatment Activity Diary, the average time spent outdoors, outside of school, was 0.67 hours per weekday and 1.29 hours per weekend day. The average time spent on media outside of school was 0.97 hours per weekday and 2.87 hours per weekend day.

Out of the 63 parents who completed the Parent Survey prior to the treatment, parents estimated their children were outside an average of 2.68 hours a day and were on electronics an average of 1.89 hours a day. The students of those 63 parents reported on the Pre-Outdoor Education Impact Survey being outdoors 3.58 hours a day, a difference of 0.9 hours from what their parents stated. Those students also reported being on electronics 3.3 hours, a difference of 1.41 hours from their parents' estimate (Figure 2).

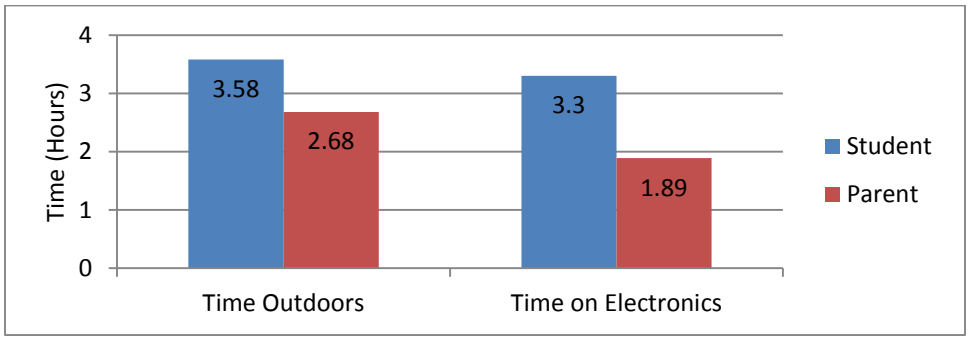


Figure 2. Parent estimate of child's time spent outdoors and on electronics vs. students' reported time outdoors and on electronics, (*n*=63).

When the students were asked if they felt that electronics, television, and other technologies kept them from spending time outdoors, the answer most often chosen was *sometimes* for both the Pre- and Post-Outdoor Educational Impact Survey. Prior to the implementation of the outdoor experiences, students were given the Pre-Student Nature Survey and asked, "Who or what has taught you the most about nature and the outdoors?" The majority of the students, 65%, responded that their parents had taught them the most

about nature and the outdoors (*n*=98). Other responses included *family other than parents* at 12%, *school or teachers* at 12%, *books and television* at 4%, *hunter education or Boy Scouts* at 3%, *self* at 3%, and *everyone/don't know* at 2%. After the outdoor experiences, parents still remained first for having taught their child most about nature and the outdoors at 48%, followed by school or teachers at 18%. Self rose to 16% and family other than parents declined to 9%. Everyone/don't know rose to five percent, books and television remained the same at four percent, and hunter education or Boy Scouts came in at two percent (*n*=100). The greatest changes were a 17% decrease in students feeling that their parents taught them the most about the outdoors. The other two major changes were students giving credit to educating themselves about the outdoors with a 13% increase and students giving school or teachers credit with a 6% increase (Figure 3).

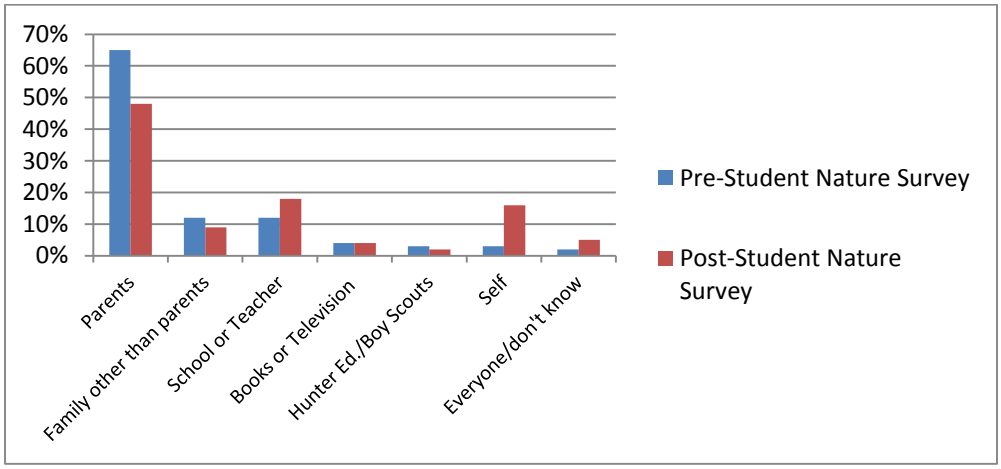


Figure 3. Who or what taught you the most about nature and the outdoors?, (*n*=100).

When asked in the Pre-Treatment Student Interview, if learning science can happen outside the classroom, 95% of the students said, "Yes," (*n*=22). Students gave various reasons why science could happen outside the classroom. One student said,

"Yes, because most science or discoveries happen outdoors." Five percent said science can only sometimes happen outside of the classroom. This student stated, "Sometimes you can do activities and might learn about science." During the Post-Treatment Student Interview, 100% of the students said, "Yes, science can happen outside the classroom." One student said, "Totally. Parts of science always happen outside the classroom." While another student said, "Yes, most of nature is outside the classroom. You can only use samples that are not living in the classroom."

The students' journals show that a majority of the students enjoyed being outside. Out of the 57 journals that were collected, only 5% of the students stated that they disliked being outdoors during an activity. One wrote that the activity was boring and that it was cold. Two other students commented about being cold, as well. Comments from the other 95% of the students whose reflections were positive about the outdoor experiences included, "I think that it helped my learning because I can relax." Another commented, "Yes, it helps me learn because I'm not as tired when I'm outside and the lights weren't there to give me headaches and hurt my eyes." Other students commented that they enjoyed the hands-on activities and actually getting to do activities. Ninety-five percent of the students wrote that outdoor activities benefitted their learning.

After the Water Ecology Field Day, 96% of the students who participated in the Post-Student Interview Questions for Field Days said they enjoyed the field day (n=25). One student commented, "Yes, I feel I get more learning experience outside and actually doing stuff rather than just reading about it." Another student said, "I thought it was fun because we got to try some new stuff, we may or may not have done before." Four percent said they somewhat enjoyed the field day. A student cited being cold as the

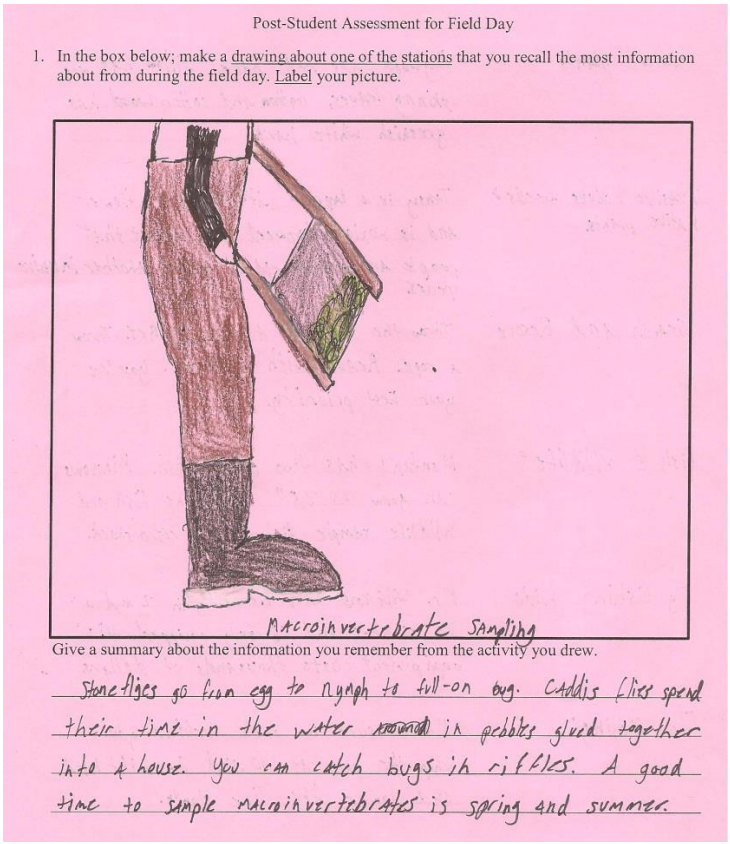
reason why she did not enjoy the day. According to Instructor Field Observations, the temperature during the Water Ecology Field Day ranged from 46 degrees Fahrenheit at the start of the field day to 60 degrees Fahrenheit by the end of the field day.

After the Winter Ecology Field Day, 80% of the students who participated in the Post-Student Interview Questions for Field Days said they enjoyed the field day (*n*=25). One student said, "Yeah, I liked it because I thought it was nice being out in the fresh air and being outside. I remember a lot more than if I just read about it." Out of the other 20% of the students, 4% stated they mostly liked the field day, 8% stated they kind of liked the field day, and 8% said they did not enjoy the day. Of those students, all mentioned that the cold weather was the reason for not enjoying the day. One student replied, "Not really because it was cold. I didn't like all the people in my group and it was hard to walk a lot." According to Instructor Field Observations, the weather for the day was intermittent snow, with snow cover. The temperature for the day was around 26 degrees Fahrenheit.

When asked in the Post-Student Interview Questions for Field Days what they would change about the Water Ecology Day, 32% would have liked more time at stations. Twenty percent said they wouldn't change anything. Sixteen percent responded that they did not like one of the stations. During the Winter Ecology Field Day, 20% would not change anything, 16% would have liked more time, 20% would have liked a warmer day, 16% didn't like one of the stations, and 12% felt they did too much hiking.

The day after each field day, students completed the Post-Student Assessment for Field Days. The students made a drawing of the station they liked the most and also listed out the other stations they remembered and gave a summary about what they did at

each station (Figure 4). For the Water Ecology Field Day, 46% of the students recalled the most information about the fly fishing station and 28% described the macroinvertebrate station as their most memorable station (*n*=88). Seven percent recalled the most about the fly fishing guide presentation and another seven percent drew and wrote about the water pollution and uses station. Six percent detailed the Search and Rescue station. Two percent of students chose the riparian area and two percent chose the invasive species area. The fisheries biology station was noted by one percent of the students.


Post-Student Assessment for Field Day

1. In the box below; make a drawing about one of the stations that you recall the most information about from during the field day. Label your picture.

Macroinvertebrate Sampling

Give a summary about the information you remember from the activity you drew.

Stoneflies go from egg to nymph to full-on bug. Caddis flies spend their time in the water around in pebbles glued together into a house. You can catch bugs in riffles. A good time to sample macroinvertebrates is spring and summer.

Figure 4. Sample of student entry for Post-Student Assessment for Field Day, Water Ecology.

The Post-Student Delayed Assessment for the Water Ecology Field Day, showed that after two weeks, 46% still remembered the most information about the fly fishing station (*n*=94). Twenty two percent provided detailed information for the macroinvertebrate station, 7% for the Search and Rescue, 6% for the fly fishing guide, 6% for the riparian area, 4% for the invasive species, 4% for the water pollution and uses, and 2% for the fisheries biologist.

In addition to drawing and summarizing the main station that students remembered, they were asked to identify and write a short summary for the remaining stations, as well. Out of the 8 stations, 66% of the students were able to recall information about all the stations. Twelve percent missed 1 station, another 12% missed 2 stations, 2% missed 3 stations, and 8% missed 4 to 7 stations. On the Two Week Post Student Delayed Assessment for the Water Ecology Field Day, 45% of the students remembered each of the stations and could recall information, while 27% missed 1 station, 6% missed 2 stations, 10% missed 3 stations, and 13% missed 4 to 7 stations. All the students were able to recall at least one station (Figure 5).

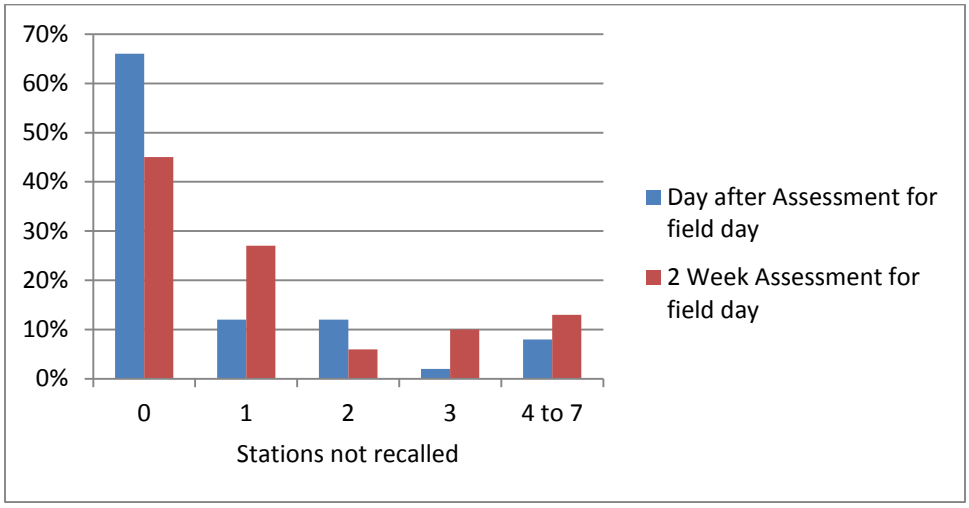
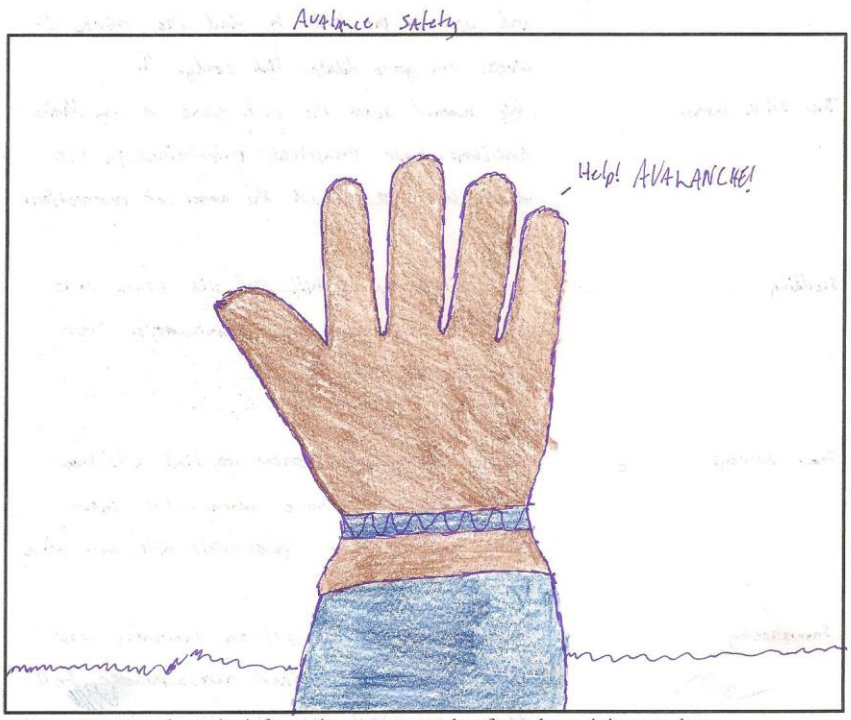


Figure 5. Students' recall of stations for the Water Ecology Field Day, (*n*=94).

For the Winter Ecology Field Day, when students took the day after Post-Student Assessment, 64% picked sledding as the station they recalled the most, 11% drew about winter survival, 8% detailed the avalanche station, 7% diagramed snowshoeing, 7% discussed the Native American stories and games, and 2% chose the wildlife winter adaptations and trapping station (*n*=88). No students chose the snow course station as the main station they remembered (Figure 6).

Post-Student Assessment for Field Day

1. In the box below; make a drawing about one of the stations that you recall the most information about from during the field day. Label your picture.



Give a summary about the information you remember from the activity you drew.

We learned that an avalanche needs a trigger, A layer of ice under the snow, and a slope to occur. It's possible to happen after a rain freezes and then snows. On a day in which an avalanche may happen, carry a beacon with you and take a partner. Or, just don't go out when an avalanche is possible.

Figure 6. Sample of student entry for Post-Student Assessment for Field Day, Winter Ecology.

Out of the 8 stations for the Winter Ecology Field Day, 72% of the students could recall all 8 stations, along with a summary of what they did at each station. Eighteen percent could recall all but one station. Two percent did not recall two of the eight stations, one percent missed three stations, and seven percent missed four to seven stations. On the two week Post-Student Delayed Assessment, 64% recalled all the

stations, while 16% recalled all but one station (*n*=86). Six percent did not recall 2 of the 8 stations, 3% missed 3 stations, and 11% missed 4 to 7 stations (Figure 7).

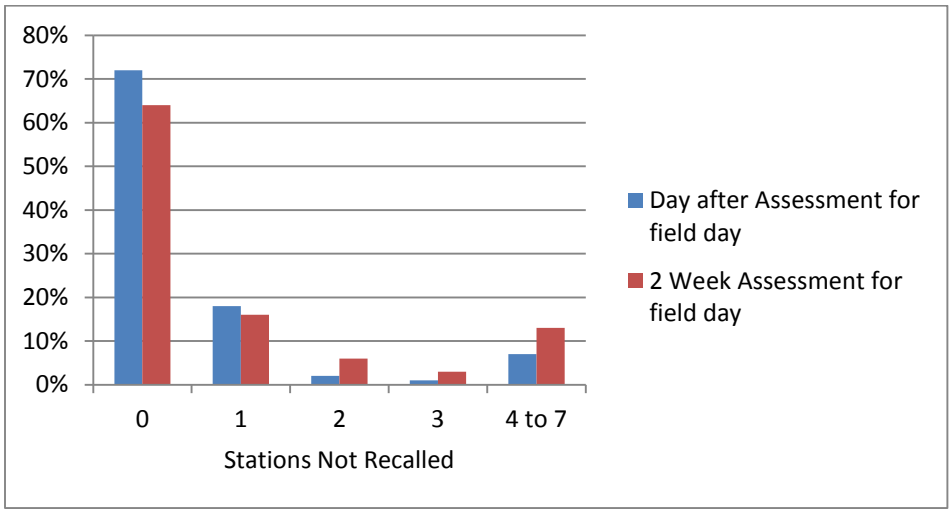


Figure 7. Students' recall of stations for the Winter Ecology Field Day, (*n*=86).

In addition to the field days, students participated in outdoor class sessions throughout the fall and winter. After each of the 5 outdoor class sessions, students were asked to complete the Anonymous Behavior Self-Assessment to rate their engagement during each 35-40 minute outdoor experience. Students used the assessment's scale of A to F to reflect on four statements regarding their behavior during each outdoor session. Students rated the performance with an A=*Great*, B=*Pretty Good*, C=*Could Use Some Work*, D=*Could Use a Lot of Work*, and F=*Terrible*. The four statements were: 1. *I was on task the entire presentation*. 2. *I paid attention to the instructor*. 3. *I did not distract my classmates*. 4. *I participated in the activities*. The following values were assigned to each letter to allow for quantitative data: A=5; B=4; C=3; D=2; and F=1. Student ratings for all four questions averaged out to be above four, which translated to students rating

themselves between an A or B indicating *Pretty Good* to *Great* behavior for each outdoor class session (Table 3, Figure 8).

Table 3
Average Anonymous Behavior Self-Assessment for Each Outdoor Experience

Experience	Date/ Temperature ˚F	I was on task the entire presentation.	I paid attention to the instructor.	I did not distract my classmates.	I participated in the activity.
Outdoor Class Session #1: Five Senses	Sept. 24, 2014 51-91 ˚F	4.58	4.76	4.51	4.89
Field Day #1: Water Ecology	Oct. 2, 2014 46-60 ˚F	4.35	4.45	4.42	4.80
Outdoor Class Session #2: Macroinvertebrates	Oct. 9, 2014 39-69 ˚F	4.46	4.68	4.48	4.78
Outdoor Class Session #3: Metric Mania	Oct. 14, 2014 50-76 ˚F	4.77	4.68	4.67	4.82
Outdoor Class Session #4: Tree Identification	Oct. 31, 2014 37-60 ˚F	4.52	4.56	4.62	4.73
Outdoor Class Session #5: Photosynthesis	Jan. 27, 2015 28-45 ˚F	4.14	4.27	4.11	4.61
Field Day #2: Winter Ecology	Feb. 3, 2015 26 ˚F	4.43	4.57	4.48	4.78

quantitative data: A=5; B=4; C=3; D=2; and F=1
A=*Great*, B=*Pretty Good*, C=*Could Use Some Work*, D=*Could Use a Lot of Work*, and F=*Terrible*.

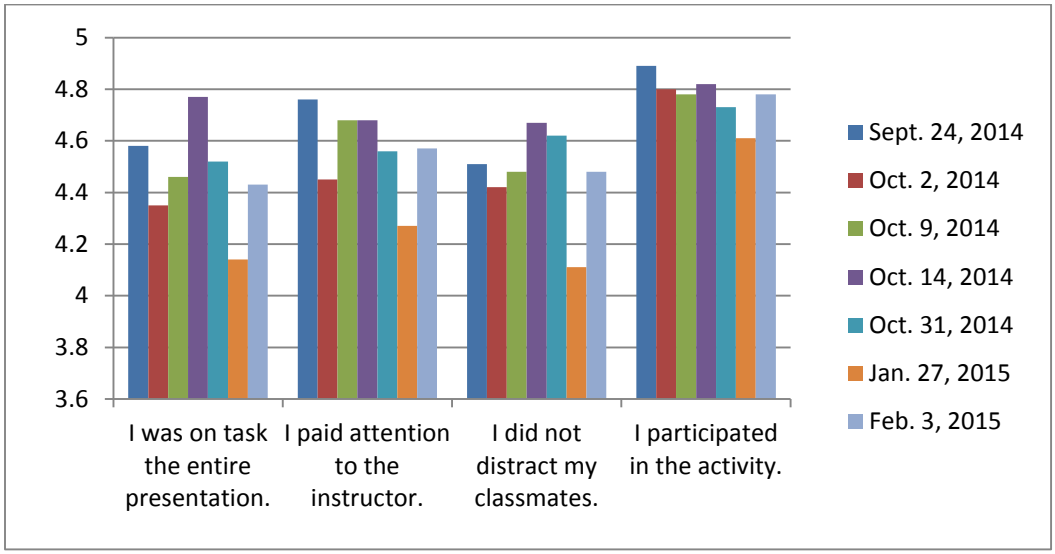


Figure 8. Students Average Rating for Anonymous Behavior Self-Assessment for Each Outdoor Experience, (*N* = 98).
Note. 5= Great; 4= Pretty Good; 3= Could Use Some Work; 2= Could Use a Lot of Work; and 1= Terrible.

In the Pre- and Post-Outdoor Education Impact Survey, students answered the question, "What percentage of your time is spent on task working productively in science class?" For the Pre-Outdoor Education Impact Survey, students' average time on task was 82.2% of the time (*n*=98). The Post-Outdoor Education Impact Survey showed the average time on task to be 82.3%. One student wrote that her time on task in science class was 30%, but when she was outside it was 85 to 100%. When comparing the Pre- and Post-Outdoor Education Impact Survey results to the percentages of the four questions on all seven Anonymous Behavior Self-Assessments, it showed that the students' view of their in class participation is lower than their ratings in the outdoor class sessions. According to the Anonymous Behavior Self-Assessments, students indicated they were on task 89.2% of the time during the entire outdoor class session. They stated they paid attention to the instructor 91.4% of the time while outdoors and did

not distract their classmates 89.4% of the time. Their ratings indicated they participated in each outdoor activity 95.4% of time (Figure 9).

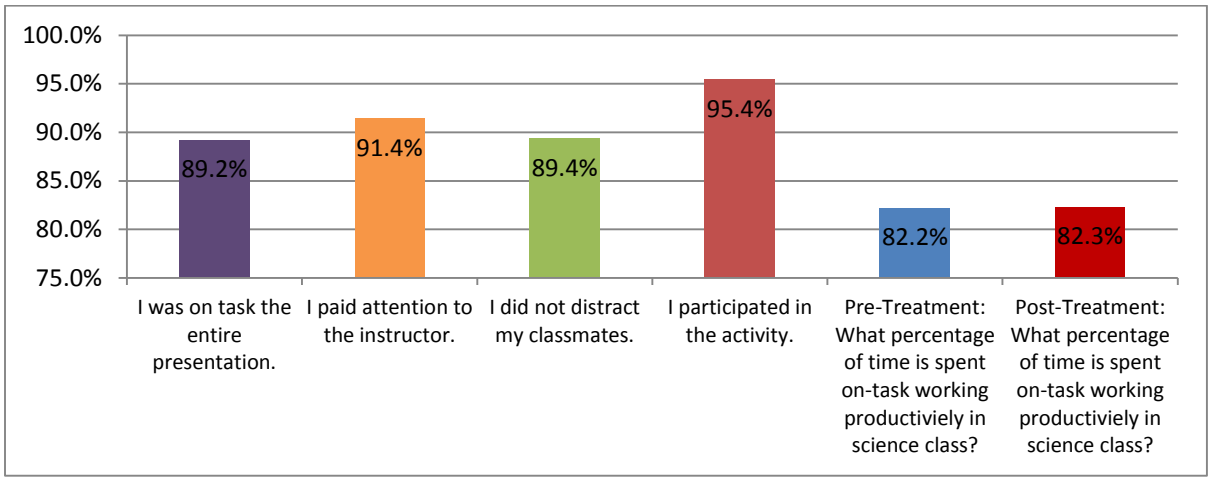


Figure 9. Pre- and Post-Outdoor Education Impact Survey percentage of time on task in-class vs. Anonymous Behavior Self-Assessments percentage of time on task outdoors, (*n*=98).

Before and after the treatment period, students also completed the Pre- and Post-Student Attitude Surveys that addressed 20 questions about their opinions and beliefs about science in school and the importance of science in their lives. The mode was calculated to determine the most common response to each question. When comparing Pre- and Post-Student Attitude Surveys, it was determined that a majority of attitudes stayed the same in regard to 50% of the questions (*n*=74). Thirty percent of the questions showed improvement in science attitude and 20% of the questions showed a decline in science attitude. Pre- and Post-Student Attitude Surveys indicated that a majority of students feel that they learn more by experiencing science than reading about it and that they would rather spend time outdoors than indoors *all the time*. Pre-treatment, most students stated they enjoyed participating in science related field trips *all the time*, but the post-treatment responses indicated that students *often* enjoy participating in such field

trips. Pre-treatment, students also said the science instruction they had received would *often* be helpful in the future. Post-treatment, a majority of the responses indicated that science instruction will only *sometimes* be helpful in the future. Students also had a decline in their attitude about using media devices to learn about science after school. On the Post-Student Science Attitude Survey, a majority of the responses indicated that students *never* used their media devices to learn about science after school. The Post-Student Science Attitude Survey also indicated that students' attitudes improved and the majority agreed that scientists make observations by using their senses *all the time*. Students' attitudes also improved with *sometimes* liking to watch shows about science, with realizing that social media *sometimes* keeps one from learning about science, with believing that science should *often* be taught outside the classroom, and with seeing that science is *often* useful for the problems of everyday life.

INTERPRETATION AND CONCLUSION

While the data did not show huge transformations in regard to impacting and benefiting students in science education, there was evidence of improvement with many students' attitudes, time on task, and motivation toward learning science. There were some mild changes in regard to students' lifestyles, perceptions, and interactions with nature, as well. In terms of recall of information, I would need to do further testing and find a way to compare the recall of outdoor learning to that of authentic indoor experiences to get comparable data as to whether outdoor learning affects recall.

In terms of students' attitudes toward learning in an outdoor environment, the data indicated that students' attitudes were better than their attitudes toward learning in the classroom. This was reflected in student comments and with the Anonymous Behavior

Self Assessments that students filled out after every outdoor experience. The majority of students rated their behavior as good to great during each outdoor class session. When this was compared to the percentage of time students estimated they were on task in regular science class, students often reflected that they were more on task in an outdoor setting. Some of the students who were often consistent behavior problems or who needed prompting to participate in typical classes, were observed to be more engaged and at times were leading discussions and actively answering questions during the outdoor experiences.

In terms of any negative attitudes about being outdoors, the data indicated that cold weather seemed to have the greatest impact on students' performance. There were a handful of students who were ill prepared for the weather during a few of the experiences and this possibly played in to their lack of enjoyment. The January 27th outdoor experience was the coldest session and had the lowest rating on the Anonymous Behavior Self-Assessment.

During each field day, students were exposed to multiple activities that gave them the opportunity to interact with a variety of professionals in an outdoor setting. At least one station at each field day focused on safety. The data collected showed there were fewer students who were uncomfortable in nature by the end of the treatment. After all seven experiences, 98% of students indicated they were comfortable being outdoors (Figure 10).



Figure 10. Sample of seventh grade outdoor educational experiences.

While teacher influence increased, parents remained the biggest influence for their child learning about nature. Even though students spent a lot of time with their parents, there was a discrepancy in the amount of time students indicated they were outdoors versus using electronics compared to the time their parents estimated. Parent estimations were lower for both student time outside and spent on electronics. Both student and parent data showed that students spent more time on electronics each day than they did being outdoors. Post treatment student data indicated that students agreed that electronics sometimes kept them from being outdoors. I believe this could be due to greater access and dependency on electronics for communication in today's society. Both electronic time and outdoor time decreased after the treatment period. The treatment began in September, when there were warmer days and more daylight hours,

and ended in February, so the decrease in electronic usage and time outside could possibly be due to the shortened length of light during the day. Students' schedules and activities varied throughout the school year, so this could have affected this as well. Alternatively, the time students spend outdoors during the treatment could have caused them to desire less time outdoors after the treatment.

I feel that, overall, students enjoyed the outdoor education experiences, but the data did not indicate that their perception about science changed significantly. This could be due to the time of year that students took the pre- and post-assessments. Topics taught in the fall versus the winter could have influenced the outcome of the data. In addition, students' attitudes toward nature were pretty good to begin with, possibly due to living in a rural area within close proximity to multiple outdoor opportunities, such as mountain trails, forests, rivers, and lakes within walking or a short driving distance. With relatively high pre-treatment attitudes, it was harder to see much of an impact in regard to post-treatment attitudes. The data did indicate an increase in students' self-awareness of how they learn. Increased credit was given to students educating themselves in regard to who taught them the most about nature and the outdoors.

VALUE

Again, the surveys and other assessment instruments were a snapshot of how the students felt during various points in a given year. If the data was collected during a few other intervals of time, the answers could possibly swing the other way or change more drastically. I feel it would be beneficial to collect additional data with more outdoor experiences throughout all seasons, not just limited to fall and winter.

In regard to additional outdoor experiences, I feel the outdoor class sessions were somewhat rushed. Ideally, a modified block schedule, would allow more time to accomplish more in-depth lessons outdoors. With the current schedule, activity time was limited due to travel time to and from outdoor spaces, such as the river. I will continue to brainstorm ways to make outdoor experiences valuable for my students with the time available.

In regard to the full-length field days, I felt the time was adequate and appreciated the support of parents who were willing to let their child stay for an extended day for the Winter Ecology Field Day. I also appreciated the support of parent chaperones, community volunteers, and local resources. I plan on following the format of the field days in future years. During the treatment period, I was able to develop a network of professionals that were willing to share their knowledge with my students.

Even with the donated time of professionals and volunteers, barriers for funding such field days continue to exist. For the treatment period, I had secured a grant that helped cover the transportation costs for the two field days. One additional field day in the spring that was outside of the treatment period was also covered by the grant. The grant will not carry over into next year, so I will need to work with my administrators to come up with additional ways of funding in order to cover the cost of any future field days.

Scheduling will continue to be a barrier, as well. I will have to continue working around State and District assessment dates, sporting events, and other teachers' project periods. The planning for each field day began months in advance and required active communication with multiple teachers, administrators, staff members, volunteers,

organizations, students, and parents. Troubleshooting remained a critical part of the planning and implementation of successful field days. The action research process allowed me to collect feedback for future field days and made me realize that all of the footwork involved made it worthwhile because I was able to give the students a positive, authentic experience.

As a teacher, the capstone process has given me the motivation to continue to keep creating outdoor experiences for my students. It allowed me to develop an action research-based project from start to finish. It also allowed me to develop tools to collect data, some of which I can use or modify in the future. I was also able to practice and apply data analysis during this process. I leave this experience still holding true to Jordan and Nadelson's (2012) belief that the outdoor learning experience is something that cannot be replicated in the classroom.

REFERENCES CITED

Angelo, T. & Cross P. (1993). *Classroom assessment techniques: A handbook for college teachers.* San Francisco, CA: Jossey Bass.

Association for Science Education Outdoor Science Working Group. (2011). *Outdoor science*. Shrewsbury: Field Studies Council and King's College London.

Coyle, K. J., & National Wildlife Federation. (2010, September). *Back to school: Back outside!: Create high performing students.* Retrieved from http://www.nwf.org/pdf/Be%20Out%20There/Back%20to%20School%20full%20report.pdf

Finkelhor, David. (2013, May 10). Five myths about missing children. *The Washington Post*. Retrieved from http://www.washingtonpost.com/opinions/five-myths-about-missing-children/2013/05/10/efee398c-b8b4-11e2-aa9e-a02b765ff0ea_story.html?hpid=z2

Foehr, U., Rideout, V., & Roberts D., & Henry J. Kaiser Family Foundation. (2010). *Generation m^2: Media in the lives of 8- to 18-years*. Retrieved February 28, 2014 from http://kaiserfamilyfoundation.files.wordpress.com/2013/04/8010.pdf

Hamilton Public School District. (2014, February 10). *2014 Annual report*. [Report]. Retrieved from http://www.hsd3.org/Uploads/file/Uploads/2014%20Anual%20Report/ 2014AnualReport.pdf

Howard, Richard. (2012, August 1). Decline of outdoor play blamed on fear of strangers and traffic. *Day Nurseries*. Retrieved from http://www.daynurseries.co.uk/news/article.cfm/id/1557623/decline-of-outdoor-play-blamed-on-fear-of-strangers-and-traffic

Infinite Campus. (2015, February 14). *Infinite Campus student data information.* Retrieved February 14, 2015.

Jordan, J., & Nadelson, L.S. (2012). Student attitudes toward and recall of outdoor day: An environmental science field trip. *Journal of Education Research, 105*(3), 220-231. doi:10.1080/00220671.2011.576715

Lakin, L. (2006). Science beyond the classroom. *Journal of Biological Education (Society of Biology), 40*(2), 89-90.

Learning through Landscapes. (2009, September). Taking it outdoors: Communication, language, and literacy. *Playnotes.* Retrieved from http://outdoormatters.co.uk/wp-content/uploads/2011/03/Playnotes-Taking-it-outdoors-communication-language-and-literacy-Sept-091287133617.pdf

Levy, A. (2013, August 6). Parents' anxieties keep children playing indoors; Fear about traffic and strangers leading to 'creepy disappearance' of youngsters from parks. *Daily Mail.* Retrieved from http://www.dailymail.co.uk/news/article-2385722/Parents-anxieties-children-playing-indoors-Fears-traffic-strangers-leading-creeping-disappearance-youngsters-parks.html

Louv, R. (2007, March/April). Leave no child inside. *Orion Magazine.* Retrieved from http://www.orionmagazine.org/index.php/articles/article/240/

Louv, R. (2008). *Last child in the woods: Saving our children from nature-deficit disorder* (updated and expanded. ed.). Chapel Hill, N.C.: Algonquin Books of Chapel Hill.

MapTechnica. (2014). *Boundary map and geodata for the zip code (ZCTA) 59840 near Hamilton, Montana, U.S.A.* Retrieved from http://www.maptechnica.com/us-zip-code-boundary-map/zip/59840

Pearson Foundation. (2012). *My voice aspirations survey: Hamilton Middle School* [Report]. Retrieved from http://admin.myvoicesurvey.org/report_print.php?Sid-803147&stid=2

Rogers, A. & Smith, M.K. (Eds.). (2012). *Learning through outdoor experience: a guide for schools and youth groups*. London: YMCA George Williams College for the Rank Foundation.

APPENDICES

APPENDIX A

WATER ECOLOGY FIELD DAY

Name_____

Water Ecology Field Day

Thursday, October 2, 2014
Kiwanis/Hamilton River Park



September 25, 2014

Dear Parent(s)/Guardian(s),

Thursday, October 2nd your child will be going on a field trip to **Kiwanis/Hamilton River Park** to study water ecology of the Bitterroot River. Stations include: macroinvertebrates; riparian area; Fish, Wildlife, and Parks biologist; introduction to fly fishing; fly casting; city water use; search and rescue; and non-native species.

In order for your child to enjoy the day and learn the concepts presented, it is important that he/she dress appropriately for the weather that day. Please have your child **dress in a few layers** because they will be outside all day, rain or shine. Students will be doing some hiking and walking, please have them wear **appropriate footwear for the outdoors** (NO flip flops).

For lunch on this day, we will be having a barbeque at the park. Lunch will include: hot dogs, chips, and cookies. Each student will be asked to contribute one item. Homeroom teachers will be assigning items to each student in the near future. **Students need to bring their own drinks**

We are looking for parents to help barbecue and serve the lunch on this day. Please let me know if you are interested in helping with this.

Please complete the following permission slip so that your student may join us on this field trip. If you are interested in being a chaperone or have any questions or concerns, please contact me at 363-**** or email me at **********.

Thank you,

----------Cut here and return the bottom portion of this letter ----------

Water Ecology Day–
Field Trip Permission Slip

_____ (student's full name) has my permission to attend the Water Ecology Day Field Trip on Oct. 2, 2014 at Kiwanis/Hamilton River Park.

Guardian's signature: _____Date: _____

Volunteers Needed: Name:_____Phone #:_____

____ I would be interested in chaperoning during this field day.

____ I would be interested in helping barbecue/serve lunch.

APPENDIX B

WINTER ECOLOGY FIELD DAY

7th Grade Winter Ecology Field Trip

Please keep this page for your records

Date: Wednesday, Feb 4

Description: Through a special grant received by the Middle School, the 7th grade students have the opportunity to participate in a day of educational learning about a variety of topics, including animal adaptation, avalanche safety, and geocaching. Students will also have the opportunity to go sledding and snowshoeing. Lost Trail Ski Area has generously donated the use of their area for this trip and we will have access to the lodge and bathrooms. The kitchen will not be open for purchases. Please note this is an educational field trip resulting in a grade for science. If your student is unable to attend, they will be required to write a paper that includes one paragraph for each topic/station missed (8 total).

Time: 8:15am-5:30pm (Due to this being an extended day, please make arrangements to pick up your child at the Middle School @ 5:30 p.m.)

- Bus leaves the Middle School at 8:30 am
- Please note the **return time is *5:30 p.m*.**

Required materials:

- Sack lunch (Please initial below)
- Warm clothing (if you need assistance with any of these items, please let Mr. Barcus know in advance). It is recommended that your student dress in layers.
  - Warm winter jacket (not just a sweatshirt)
  - Snow pants
  - Snow boots
  - Gloves
  - Hat
  - Scarf
  - Long underwear
  - Extra pair of socks

Backpack
Water bottle
Snacks

Helmet. Students will be sledding. If you would like your student to wear a helmet, please send one for them to use.

Please do not allow your student to bring money or electronics.

Chaperones:

If you are willing to chaperone, please put your name below. It will be a full day outdoors and you should bring all the required information listed above.

7th Grade Winter Ecology Field Trip

Please **return this page** to Mr. Barcus by Wednesday, 1/28

Student Name:_____

Emergency Contact Info:

1st Contact:

Name:_____

Phone:_____

Relationship:_____

2nd Contact:

Name:_____

Phone:_____

Relationship:_____

How will your student get home at 5:30 (please initial 1):

____my student may walk home

____I will pick my student up at the front of the Middle School at 5:30

____my student lives in the Hamilton school district and will ride the special Keystone activity bus home

Lunch:

____my student needs a sack lunch from the cafeteria

____my student will bring a sack lunch from home

Chaperone:

Name of parent/guardian willing to chaperone: _____

Medical Informed Consent

As the parent/guardian of the above named student, I have read the field trip information and I understand that there are risks of physical injury associated with participation in these activities. I authorize qualified emergency medical professionals to examine and, in the event of injury or serious illness, administer emergency care to the above named student. I understand that every effort will be made to contact me to explain the nature of the problem prior to any involved treatment. In the event it becomes necessary for the school district staff-in-charge to obtain emergency care for my student, neither he/she nor the school district assumes financial liability for expenses incurred because of accident, injury, illness and/or unforeseen circumstances. These activities are an extension of the school education program and student conduct is to be in accordance with the school's published rules and regulations.

As the parent or legal guardian, I hereby give permission for my child to participate in the field trip sponsored by the Hamilton School District. In consideration of the district's agreement to allow my child to participate in the referenced program, I agree to accept responsibility for any loss or injury to my child that occurs during my child's participation in this program that is not the result of fraud, willful injury or the willful or negligent violation of a law by a trustee, employee or agent of the Hamilton School District.

By signing below, I am stating that I have read and understand the above.

_____ _____ _____

Date Printed Name Signature

APPENDIX C

MONTANA STATE UNIVERSITY'S INSTITUTIONAL REVIEW BOARD APPROVAL

MONTANA STATE UNIVERSITY

INSTITUTIONAL REVIEW BOARD
For the Protection of Human Subjects
FWA 00000165

960 Technology Blvd. Room 127
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Montana State University
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Telephone: 406-994-6783
FAX: 406-994-4303
E-mail: cherylj@montana.edu

Chair: Mark Quinn
406-994-5721
mquinn@montana.edu
Administrator:
Cheryl Johnson
406-994-6783
cherylj@montana.edu

MEMORANDUM

TO: Jeremy Barcus and John Graves

FROM: Mark Quinn, Chair Mark Quinn CJ

DATE: September 8, 2014

RE: "*How Incorporating Outdoor Educational Experiences Impacts and Benefits 7th Grade Students in Science Education*" [JB090814-EX]

The above research, described in your submission of September 8, 2014, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal regulations, Part 46, section 101. The specific paragraph which applies to your research is:

_X_ (b) (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

_X_ (b) (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.

____ (b) (3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

___ (b) (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.

____ (b) (5) Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

_____ (b) (6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

Although review by the Institutional Review Board is not required for the above research, the Committee will be glad to review it. If you wish a review and committee approval, please submit 3 copies of the usual application form and it will be processed by expedited review.

APPENDIX D

PRE- AND POST-OUTDOOR EDUCATION IMPACT SURVEY

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Pre-Outdoor Education Impacts Survey

For questions 1-5 answer the questions by circling the answer that best fits your experience or feeling about each question. For questions 6-8, answer them by writing a thorough answer below each question.

1. Do you feel comfortable spending time outdoors?

   Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

2. Do you feel spending time outdoors benefits your learning?

   Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

3. Do you find outdoor educational experiences beneficial?

   Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

4. Does being outdoors motivate you to learn?

   Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

5. Do you feel that electronics, Television, and other technologies keep you from spending time outdoors?

   Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

6. What percentage of your time is spent on-task working productively (completing lessons, following instructions, etc.) in science class?

   Percentage _____%

7. How many hours, on average during the day, do you spend outdoors (without using technology), outside of school. (Explain how you spend your time outdoors.)

   Hours _____

8. How many hours, on average during the day do you spend watching TV, playing video games, or using other electronic devices, outside of school? (Explain the amount of time spent on each device.)

   Hours _____

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Post-Outdoor Education Impacts Survey

For questions 1-5 answer the questions by circling the answer that best fits your experience or feeling about each question. For questions 6-8, answer them by writing a thorough answer below each question.

1. Do you feel comfortable spending time outdoors?

   Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

2. Do you feel spending time outdoors benefits your learning?

   Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

3. Do you find outdoor educational experiences beneficial?

   Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

4. Does being outdoors motivate you to learn?

   Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

5. Do you feel that electronics, Television, and other technologies keep you from spending time outdoors?

   Never 1 Hardly Ever 2 Sometimes 3 Often 4 All the Time 5

6. What percentage of your time is spent on-task working productively (completing lessons, following instructions, etc.) in science class?

   Percentage _____%

7. How many hours, on average during the day do you spend outdoors (without using technology), outside of school. (Explain how you spend your time outdoors.)

   Hours _____

8. How many hours, on average during the day do you spend watching TV, playing video games, or using other electronic devices, outside of school? (Explain the amount of time spent on each device.)

   Hours _____

APPENDIX E

PRE-TREATMENT STUDENT INTERVIEW QUESTIONS

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Student Interview Questions

1. Do you think learning science can happen outside of the classroom?

2. How do you feel about spending time in nature?

3. What is your favorite outdoor place to be? Why is it your favorite?

4. Describe the activities you do during a typical afternoon and evening once you have left school.

5. Of the following electronic devices, which ones do you use each day? What do you use them for?

___Cellphone
__Calling
__Texting
__Playing games/apps
__Watching videos
__Social Media (Facebook, Instagram, Snapchat)
__Other:_____

___Computer
__Homework
__Internet
__Games
__Social media
__Watching videos
__Other:_____

__Tablet (Such as iPad or GalaxyTab)
__Homework
__Internet
__Games
__Social media
__Watching videos
__Other:_____

__iPod/MP3 player
__Listening to Music
__Internet
__Texting
__Games
__Social media
__Watching videos
__Other:_____

__Television

__Gaming Systems (ex. Wii, X-box)—Which type(s)?
_____
_____

__Portable Gaming Systems (ex. Nintendo DS, PSP)- Which type(s)?
_____

__E-Readers (Kindle, Nook)
_____

__Any other device not listed?
_____

6. Do you spend time as an entire family outdoors? _____ If so, what outdoor activities do you do together? If not, what reasons do you feel keep your family from spending time outdoors?

7. What outdoor field trips do you have memories of? Can you tell me what you did on each field trip?

8. Is there anything else you want me to know?

APPENDIX F

PRE- AND POST-TREATMENT ACTIVITY DIARY

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Pre-Treatment Activity Diary

Directions: You will need to record your daily activities by filling in the table below. Please choose one school day to record your activities.

Weekday	**Day of the week: _____ Date_____**
Time	**Activity** (ex. Slept, Played football outside, At school, Watched TV, Texted, Went for a walk, Ate, etc.)
5-6 AM	
6-7	
7-8	
8-9	
9-10	
10-11	
11-12	
12-1 PM	
1-2	
2-3	
3-4	
4-5	
5-6	
6-7	
7-8	
8-9	
9-10	
11-12	
12-1 AM	
1-2	
2-3	
3-4	
4-5	

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Pre-Treatment Activity Diary

Directions: You will need to record your daily activities by filling in the table below. Please choose one weekend day (Saturday or Sunday) to record your activities.

Weekend	**Day of the weekend _____ Date_____**
Time	**Activity** (ex. Slept, Played football outside, Watched TV, Went for a hike)
5-6 AM	
6-7	
7-8	
8-9	
9-10	
10-11	
11-12	
12-1 PM	
1-2	
2-3	
3-4	
4-5	
5-6	
6-7	
7-8	
8-9	
9-10	
11-12	
12-1 AM	
1-2	
2-3	
3-4	
4-5	

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Post-Treatment Activity Diary

Directions: You will need to record your daily activities by filling in the table below. Please choose one school day to record your activities.

Weekday	**Day of the week: _____ Date_____**
Time	**Activity** (ex. Slept, Played football outside, At school, Watched TV, Texted, Went for a walk, Ate, etc.)
5-6 AM	
6-7	
7-8	
8-9	
9-10	
10-11	
11-12	
12-1 PM	
1-2	
2-3	
3-4	
4-5	
5-6	
6-7	
7-8	
8-9	
9-10	
11-12	
12-1 AM	
1-2	
2-3	
3-4	
4-5	

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Post-Treatment Activity Diary

Directions: You will need to record your daily activities by filling in the table below. Please choose one weekend day (Saturday or Sunday) to record your activities.

Weekend	**Day of the weekend _____ Date_____**
Time	**Activity** (ex. Slept, Played football outside, Watched TV, Went for a hike)
5-6 AM	
6-7	
7-8	
8-9	
9-10	
10-11	
11-12	
12-1 PM	
1-2	
2-3	
3-4	
4-5	
5-6	
6-7	
7-8	
8-9	
9-10	
11-12	
12-1 AM	
1-2	
2-3	
3-4	
4-5	

APPENDIX G

PARENT SURVEY

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Parent Survey

I am currently working on my Masters of Science in Science Education and am looking at the effects of outdoor educational experiences and how they impact and possibly benefit 7th grade students in science education. I would be grateful if you would fill out the following survey about your student, so I can get a parent's perspective on each child's activities outside of school.

No names will be used in my reporting of information and all answers will remain anonymous.

Thank you for you participation,

Jeremy Barcus
7th Grade Science Teacher

Feel free to contact me at _____ or email me at _____.

Please do not ask your child these questions. Just write down your perceptions for each question!

1. How does your child feel about spending time outdoors in nature? Why do you think they feel this way?

2. What indoor and outdoor activities does your child prefer?

3. How much time, on average, (outside of school) does your child spend on electronic devices each day?

   Hours_____

4. How much time, on average, (outside of school) does your child spend outside each day?

   Hours_____

5. What outdoor activities do you like to participate in as a family?

6. Is there anything else you would like to tell me about your child?

APPENDIX H

PRE- AND POST-STUDENT NATURE SURVEY

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Pre-Student Nature Survey

Please answer the following questions about nature and the outdoors

1. Do you feel comfortable spending time in the outdoors? Explain what has led you to be comfortable or uncomfortable in the outdoors.

2. What do you like best about nature and the outdoors?

3. What do you dislike about nature and the outdoors?

4. What safety things do you need to consider when in the outdoors?

5. What do all organisms need to survive in nature?

6. Who or what has taught you the most about nature and the outdoors?

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Post-Student Nature Survey

Please answer the following questions about nature and the outdoors

1. Do you feel comfortable spending time in the outdoors? Explain what has led you to be comfortable or uncomfortable in the outdoors.

2. What do you like best about nature and the outdoors?

3. What do you dislike about nature and the outdoors?

4. What safety things do you need to consider when in the outdoors?

5. What do all organisms need to survive in nature?

6. Who or what has taught you the most about nature and the outdoors?

APPENDIX I

PRE- AND POST-SCIENCE ATTITUDE SURVEY

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Pre-Student Science Attitude Survey

Directions: The statements in this survey have to do with your opinions and beliefs about science in school and the importance of science in your life. Please read each statement carefully, and select the answer that best expresses your own feelings. Remember this is not a test, and there are no "right" or "wrong" answers. Please circle the answer that best fits your belief.

	Never	Hardly Ever	Sometimes	Often	All the Time
1. I enjoy science.	1	2	3	4	5
2. Science learning should only happen in the classroom.	1	2	3	4	5
3. Nature and science go hand in hand.	1	2	3	4	5
4. I enjoy participating in science related field trips.	1	2	3	4	5
5. I usually understand what we are doing in science.	1	2	3	4	5
6. Making observations is not important in most science investigations.	1	2	3	4	5
7. The subject of science has little relation to what I do outside of school.	1	2	3	4	5
8. The science instruction, I have received will be helpful to me in the future.	1	2	3	4	5
9. Scientists make observations by using their senses.	1	2	3	4	5
10. Science is useful for the problems of everyday life.	1	2	3	4	5
11. I like to watch TV shows about science.	1	2	3	4	5
12. I think science is only important at school.	1	2	3	4	5
13. I learn more by experiencing science than reading about it.	1	2	3	4	5
14. I usually try my best in science class.	1	2	3	4	5
15. Reading books is my favorite way to learn about science.	1	2	3	4	5
16. Science should be taught outside the classroom.	1	2	3	4	5
17. I use my media devices to learn about science after school.	1	2	3	4	5
18. Social media keeps me from learning about science.	1	2	3	4	5
19. I would rather spend time outdoors than indoors.	1	2	3	4	5
20. When I grow up I would like to have a job that is related to science.	1	2	3	4	5

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Post-Student Science Attitude Survey

Directions: The statements in this survey have to do with your opinions and beliefs about science in school and the importance of science in your life. Please read each statement carefully, and select the answer that best expresses your own feelings. Remember this is not a test, and there are no "right" or "wrong" answers. Please circle the answer the answer that best fits your belief.

	Never	Hardly Ever	Sometimes	Often	All the Time
1. I enjoy science.	1	2	3	4	5
2. Science learning should only happen in the classroom.	1	2	3	4	5
3. Nature and science go hand in hand.	1	2	3	4	5
4. I enjoy participating in science related field trips.	1	2	3	4	5
5. I usually understand what we are doing in science.	1	2	3	4	5
6. Making observations is not important in most science investigations.	1	2	3	4	5
7. The subject of science has little relation to what I do outside of school.	1	2	3	4	5
8. The science instruction, I have received will be helpful to me in the future.	1	2	3	4	5
9. Scientists make observations by using their senses.	1	2	3	4	5
10. Science is useful for the problems of everyday life.	1	2	3	4	5
11. I like to watch TV shows about science.	1	2	3	4	5
12. I think science is only important at school.	1	2	3	4	5
13. I learn more by experiencing science than reading about it.	1	2	3	4	5
14. I usually try my best in science class.	1	2	3	4	5
15. Reading books is my favorite way to learn about science.	1	2	3	4	5
16. Science should be taught outside the classroom.	1	2	3	4	5
17. I use my media devices to learn about science after school.	1	2	3	4	5
18. Social media keeps me from learning about science.	1	2	3	4	5
19. I would rather spend time outdoors than indoors.	1	2	3	4	5
20. When I grow up I would like to have a job that is related to science.	1	2	3	4	5

APPENDIX J

ANONYMOUS BEHAVIOR SELF-ASSESSMENT

Participation is voluntary and will not affect a student's grade or class standing in any way.

Date:_____

Anonymous Behavior Self-Assessment

Rate your behavior and how you did during the outdoor experience.

A = GREAT!; B = pretty good; C = could use some work; D = could use a lot of work; F = TERRIBLE	
Behavior	Student Assessment
1. I was on task the entire presentation.	A B C D F
2. I paid attention to the instructor.	A B C D F
3. I did not distract my classmates.	A B C D F
4. I participated in the activity.	A B C D F

APPENDIX K

SCIENCE NOTEBOOK FORMATING PROMPTS

Science Notebook Format Prompts
(To be used with each Outdoor Class Session)

Record the following information in your journal each time we go outside.

Date:_____ Activity Name:_____

1. Observations (list/draw/label observations made while outside: Prior to the activity & during the activity)

2. Notes/Questions from the activity

3. Reflection/Feelings
    a. How did I feel about learning outside today? Why did I feel this way?
    b. Did being outside help my learning?

4. After the activity is complete, answer the following "Minute Paper" questions in complete sentences.
    a. What was the most important thing I learned during the field experience?
    b. What important question remains unanswered?

5. After each experience, complete the Anonymous Behavior Self-Assessment and place on fish tank on your way out the door. (Do not write your name on this.)

APPENDIX L

POST-STUDENT ASSESSMENT FOR FIELD DAY

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: ________Date:_____

Post-Student Assessment for Field Day

1. In the box below; make a drawing about one of the stations that you recall the most information about from during the field day. Label your picture.

   Give a summary about the information you remember from the activity you drew.

_____

_____

_____

_____

_____

2. In the space below make a list of the other stations you remember and write a description about what each of the stations was about. (Use complete sentences.)

Other Stations:	Brief Description of What You Learned at Each Station:
_____	_____
	_____
	_____
_____	_____
	_____
	_____
_____	_____
	_____
	_____
_____	_____
	_____
	_____
_____	_____
	_____
	_____
_____	_____
	_____
	_____

APPENDIX M

POST-STUDENT DELAYED ASSESSMENT FOR FIELD DAY

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: ________ Date:_____

Post-Student (Two Week) Delayed Assessment for Field Day

2. In the box below; make a drawing about one of the stations that you recall the most information about from during the field day. Label your picture.

Give a summary about the information you remember from the activity you drew.

_____

_____

_____

_____

_____

2. In the space below make a list of the other stations you remember and write a description about what each of the stations was about. (Use complete sentences.)

Other Stations:	Brief Description of What You Learned at Each Station:
_____	_____
	_____
	_____
_____	_____
	_____
	_____
_____	_____
	_____
	_____
_____	_____
	_____
	_____
_____	_____
	_____
	_____
_____	_____
	_____
	_____

APPENDIX N

POST-STUDENT INTERVIEW QUESTIONS FOR FIELD DAY

Participation is voluntary and will not affect a student's grade or class standing in any way.

Student's Name: _____ Date:_____

Post-Student Interview Questions for Field Day

1. Did you enjoy the field day? Explain why or why not.

2. What station did you like the best and what do you remember relating to that station?

3. What was the overall theme of the field day?

4. If you could change one thing relating to the field day what would it be?

5. Is there anything else you want me to know?