

The Effects of the Natural Environment and Classroom On-Task Behavior

An Action Research Report
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Abstract

This Action Research Study is designed to evaluate the effect that brief exposure to the natural environment every day before class has on classroom on-task behavior. In comparative studies, nature has shown to have a positive effect on energy, cognitive abilities, attention, self-esteem, and overall health. However, it is uncertain if these effects are immediate or are caused by total immersion in the natural environment over a long period of time. This research took place in a suburban public Montessori school classroom with 20 students, ranging in age from 9 to 11 years old. This study analyzed data from a survey given to classroom students, before and after an eight-week observation period. Additionally, observations of on-task behavior, number of redirections required during a work period, and student attendance were collected by the researcher. By exposing children to the natural environment for a brief period before each school day, the on-task behavior of student increased and the number of redirections required by the classroom teacher decreased. The frequency of student tardiness also decreased on weeks when students began the day outside.

Keywords: Natural environment, on-task behavior, student focus, classroom engagement, academic achievement, teaching outdoors, environmental education

Introduction

My research topic is based on my passion for environmental studies. I am very enthusiastic about getting students outdoors and teaching them the importance of protecting the natural environment. In my observations, when students have increased exposure to nature, a certain appreciation and curiosity develops in them for the environment. The time spent in the natural environment seemed to transform into a calming ability to focus, an improvement in student attitudes, and improved social interactions in the classroom.

During the last 3 years of teaching in a public Montessori elementary classroom, I have noticed a large percent of my students not completing work assignments on time. Through observation, I attribute part of this trend to the inability of students to stay on task during work time. It is this struggle that led me to investigate the positive effects of exposing students to nature.

Since the beginning of recorded history, the natural environment has had an active role in human development and overall well-being. The amount of research supporting the positive health benefits of exposing children to nature and the role it can play in child development continues to grow. Montessori education aims to provide education of the whole child by supporting the child's physical, social, emotional, and intellectual development. Maria Montessori's philosophy of education supports the growing evidence that exposure to nature has a positive impact on child development. Sticking to this philosophy, my research has been focused on finding relationships between exposure to nature and student on-task behaviors in the classroom.

Literature Review

Physical Benefits

Previous research suggests that exposure to nature impacts children's physical, social, emotional, and intellectual development. According to the research conducted by Barton, Sandercock, Pretty, and Wood (2015) and Martenson, Boldman, Soderstrom, Blennow, Englund, & Grahn (2009), exposure to nature and environments designed to replicate nature, increases the amount of physical activity in which children choose to engage. Children with lower fitness levels tend to be disengaged with the more traditional playground activities; however, a nature based environment is likely to engage children of all abilities (Barton, Sandercock, Pretty, & Wood, 2015). Participants reported greater enjoyment and satisfaction with outdoor activities and declared a greater intent to repeat the activity again (Coon & Thompson, 2011). In a similar study, students report higher levels of physical and mental energy during and following outdoor exposure (Ryan et al., 2012). For these reasons and more, the amount of time children spend in nature should be examined with a closer eye.

Social Benefits

In addition to increasing physical activity, nature has a powerful way of changing student behaviors through its ability to decrease aggression and improve social skills. Children demonstrate more cooperative play, civil behavior, and positive social relationships when surrounded by green school yards (Bell & Dymont, 2008). In opposition, students who must travel more than 500 meters to access green spaces have a higher tendency to experience relationship problems with peers (Markevych et al., 2014). This research was also supported by Carrus, Passiatore, Pirchio, & Scopelliti (2015), when observing preschool children in indoor and outdoor spaces. They found that the social interactions between students have more frequent

positive relations (i.e. hugging) than negative social relations (i.e. hitting) on days spent outdoors compared to days spent indoors. With improved abilities to play and communicate with others comes the potential to make new friends and promote self-confidence in students. Weinstein, Przybylski, & Ryan (2009) investigated how nature can make students more caring of peers through increased intrinsic aspirations. Exposure to the natural environment improved children's intrinsic motivations and decreased their extrinsic motivation. For example, children who were exposed to the natural environment were intrinsically motivated to help a classmate because they felt good about it and less likely to be motivated by recognition or reward.

Emotional Benefits

Research suggests that increased exposure to nature can have a positive effect on emotional, behavioral, and psychological development of students. This positive effect has been observed when students are simply given a view of the natural environment. Students' attitudes about their classmates were more positive and stress levels were reported to be lower in rooms where students could view green space rather than the urban landscape (i.e. a retaining wall) (Benfield, Rainbolt, Bell, & Donovan, 2015). This positive effect is increased when children have access to outdoor space. A study comparing the affective state of preschool children, found positive behaviors, such as laughter, were more frequent when students spent more time outdoors than indoors during the school day (Markevych et al., 2014). Walking in nature compared to walking in an urban environment improved student's mood (Berman et al., 2012). Exposure to nature may restore self-regulation after experiencing ego-depletion (Chow & Lau, 2015).

Cognitive Benefits

When children are exposed to the natural environment, their cognitive and intellectual development may be impacted in a positive way. Chow and Lau (2015) found that students show greater improvement in logical reasoning after looking at pictures of nature compared to looking at images of urban settings. Exposure to the natural environment has been shown to increase test scores in school aged children (Benfield et al., 2015; Dadvand et al., 2017). This claim was supported by Benfield et al. (2015), when students who were exposed to images of nature demonstrated an increased performance in logical reasoning when undergoing anagram testing. Additionally, students with a view of the natural environment, compared to students without, had higher end of semester grades (Benfield, Rainbolt, Bell, & Donovan, 2015). Similar results were suggested in a longitudinal study conducted by Dadvand et al. (2017). They concluded that students who lived in areas surrounded by nature demonstrated higher scores on tests of attention (Dadvand et al., 2017).

With more and more distractions present in today's American culture, students need to be able to maintain high levels of attention to be successful. Kuo, Browning and Penner (2018) studied how to improve attention and student engagement within the learning environment. Their research suggests that after presenting lessons outdoors, students maintained higher levels of engagement when compared to lessons presented indoors (Kuo, Browning & Penner, 2018). Similar findings suggest that hyperactivity levels and inattention/impulsivity of children are lowered with increased exposure to the outdoor environment. Playgrounds with more square footage and those that had more natural elements integrated within the play structures reduce levels of hyperactivity and improve attention in students (Martenson et al., 2008).

Conclusion of Literature Review

The range of physical, social, emotional and cognitive effects that exposure to nature has on children is astounding. Not only being in nature, but even looking at images of the natural environment effects body, mind, and soul. If you try to imagine a group of elementary students playing outside near a field of tall grass, surrounded by trees, alongside a winding river, how are those students behaving? Research demonstrates that children who have exposure to places like this report less stress (Benfield, Rainbolt, Bell, & Donovan, 2015), higher levels of physical activity (Barton, Sandercock, Pretty, & Wood, 2015), and better moods towards classmates and their teachers (Bell & Dymont, 2008). With more and more schools being built in areas where there is less of the natural environment available, teachers and parents should be looking for ways to expose their children to green space on a regular basis (Bell & Dymont, 2008). The purpose of this action research was to investigate the effectiveness of daily exposure to the natural environment on improving student's ability to stay on task in the classroom. This study was designed to analyze the effects of exposing nine to eleven-year-old students to the natural environment before school. The expected outcome of this action research was to find an increase in the frequency of on-task behavior during the morning work period, and a reduction in the number of times students' behavior required redirection from the teacher. It was also expected that social interactions would become more positive, and that students' attitudes about school would improve. Finally, with an improved attitude towards school, the number of students tardy would decrease.

Methodology

Participants and Setting

Participants in this study include 20 fourth and fifth grade students in a mainstreamed setting, enrolled in a suburban, public Montessori elementary school. The classroom is comprised of predominantly white, mixed gender, nine- to eleven-year-olds. A parent permission letter for students to participate in the research were signed by all parents/guardians (see Appendix A for parent letter). Research was conducted in an Upper Elementary Montessori classroom and the surrounding natural environment within walking distance of the school. This outdoor area includes a wooded hillside, a small field with prairie grasses, and a walking path following the river. A favorite destination for students is a small pier with wooden benches overlooking the river. The classrooms north facing wall has several windows that provide abundant light and a view of the neighborhood. There has been an attempt to bring the natural environment inside with several potted plants and a part of the room designated to growing plants. With over five hundred square feet of space, this classroom has adequate room for movement as well. The school has only 9 classrooms and about 170 students, creating a very close social community.

Procedure

Data was collected for a total of eight weeks; beginning in mid-January and ending in late March. A list of questions in a survey format was completed by students before beginning the eight weeks of data collection (see Appendix B for survey questions). The survey investigated general information about environmental literacy, satisfaction of academic environments, peer relationships, self-report of on-task behaviors, perceived peer on task behavior, and time spent in the natural environment when at home. The questions were answered using student Chromebooks. Students were asked to complete the questions without talking to classmates and

using their best judgement. An observer was available if students had questions. All students completed the survey within a single morning work period. After the eight weeks of data collection, the students again completed the form. Questions were shuffled in a random order and the same process of filling out the form during the work period was used.

An alternating ABAB design pattern was used to observe behavior patterns for indoor weeks versus outdoor weeks. For one whole week the students started the school day inside with the only exposure to the natural environment being the playground and blacktop outside the school building. The following week the children started the school day by walking to the river walk where they explored the wooded hillside and open field. This pattern was repeated for the duration of the eight-week observation period.

Observation weeks were split into two different categories, where student started their day either in in the classroom environment or in the outdoor environment. On mornings when students started the day in the classroom, daily morning routines were completed prior to the observation period. Their morning routines consists of correcting the morning work, outlining the daily schedule, allowing for students to share concerns or celebrations and concluded with the school-wide announcements. Students are then released to begin their self-guided work period. During this work period, the guide would perform a 20-minute observation of student behavior. An observation form was used to track student behaviors every 5 minutes for a total of 20 minutes (see Appendix C for observation form). This was done four days a week due to scheduling.

On mornings when students started their day in the outdoor environment, attendance and lunch count were taken and students lined up immediately to go outside. Once the class reached the walking path near the river, they were instructed to participate in either structured activities,

meditation sessions, or to freely explore in the outdoor environment. Upon returning to the classroom the guide would perform a 20-minute observation, beginning 10 minutes after students entered the classroom. An observation form was used to track student behaviors every 5 minutes for a total of 20 minutes four days a week (see Appendix C).

Twenty-nine total observations were completed. The classroom guide completed 25 of these observation forms. Four out of the 28 observations were completed by an independent observer in the classroom. When temperatures were too cold for children to be outside (0 degrees Fahrenheit or below), school had been canceled due to holiday or inclement weather, no data was collected. This occurred three times throughout the eight-week period.

One day each week students were not assessed for on task behavior. On this morning the observer kept tally of how many times students needed redirection. Redirection was never done while in a lesson. Student behaviors which required redirection included, but are not limited to the following: Using work as a prop for an extended amount of time, disruptive behavior, inappropriate use of technology or classroom materials, frequent wondering around the classroom, etc. When redirection was given, the guide approached the student calmly and quietly and asked them what they were focused on. If students could correct the behavior before the lesson ended, no tally was recorded, as no redirection was needed. Students were either self-correcting of the behavior or an alternative was kindly suggested.

Prior to this investigation, four students were consistently showing up tardy for class. Tardy is defined by the Infinite Campus student attendance software as showing up between 5-20 minutes after class begins. On weeks when the class began their day outside, students that would arrive late to school were asked to wait near the school office for the class to return. When students arrive late to school, a tardy is marked in the software system for later analysis.

Materials

Many of the materials needed to complete this action research project were made by the classroom guide or provided by nature. Below you will find a list of materials used by students and a list of materials used by the classroom guide.

Materials used by participating students:

- Nature Journals - created by the students
- Field guide for identifying birds
- Field guide for identifying animal tracks
- Binoculars
- Materials for certain outdoor activities - provided by the teacher

Materials used by the classroom guide and independent observer

- Parent permission form - allowing students to participate in action research (Appendix A)
- Project Wild outdoor curriculum - resource for outdoor activities
- Google Forms survey - created by the classroom guide (Appendix B)
- Student observation form - created by the classroom guide (Appendix C)
- Observation journal - reflection of behavior observations outdoors and in the classroom
- Infinite Campus student attendance software

Results and Data Analysis

Analysis of on-task behavior

On-task behaviors were tallied and totaled for each day of observation. On-task behavior was defined as students completing their work, being focused on a task, choosing a work, supporting

another student, or receiving support from another student. Weekly on-task behavior totals were averaged and on-task behavior during indoor weeks was compared to on-task behavior during outdoors weeks. As noted in Table 1, students demonstrated an average of 53.36 on-task behavior during indoor days and an average of 58.71 on-task behaviors during outside days. This demonstrates a 9% increase in on-task behavior when students start the day outdoors compared to days started indoors. The data is represented in Table 1 below.

When comparing data from week to week, a steady increase of on task behavior is shown. The data in Table 2 shows weekly averages of both inside days and outside days. Over the eight weeks, a steady increase of on-task behavior is shown for both days beginning inside as well as outside. An 11% increase in on-task behavior was made from the first week to the last week when students started in the natural environment. Only a 3% increase in on-task behavior was gained when students began their day inside.

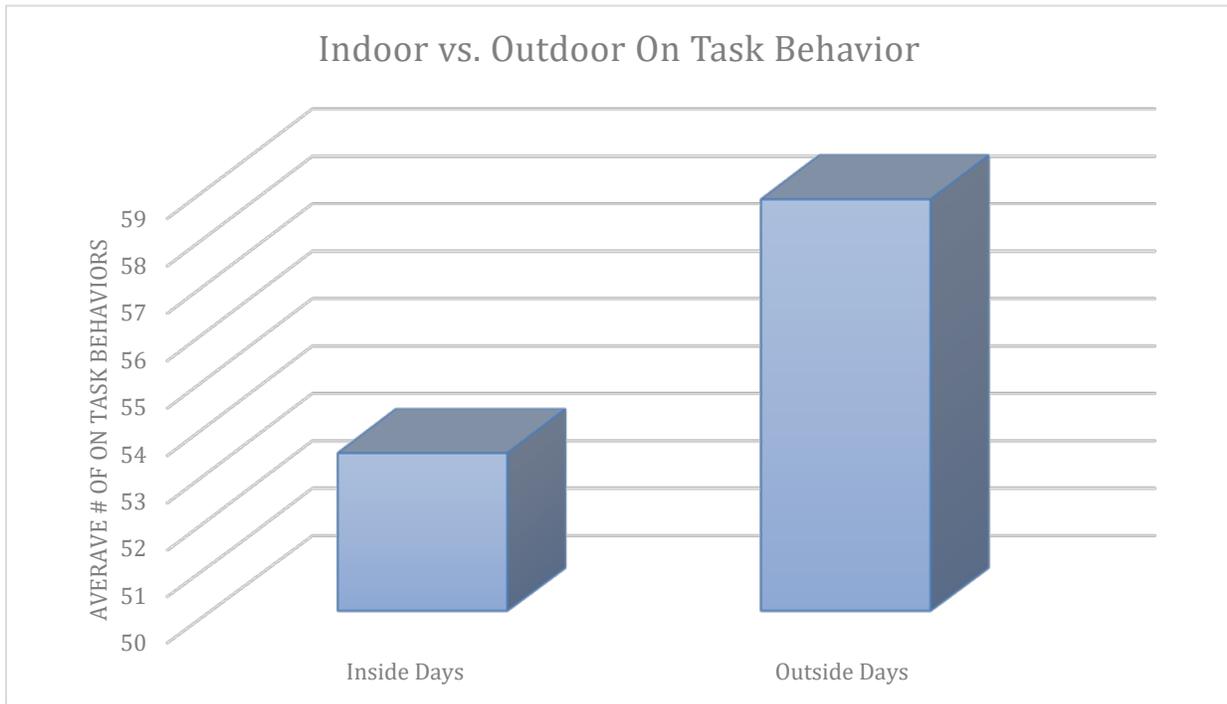


Table 1. Average on-task behaviors of students over the course of the eight-week observation period on inside days (n=53.36) and outside days (n=58.71).

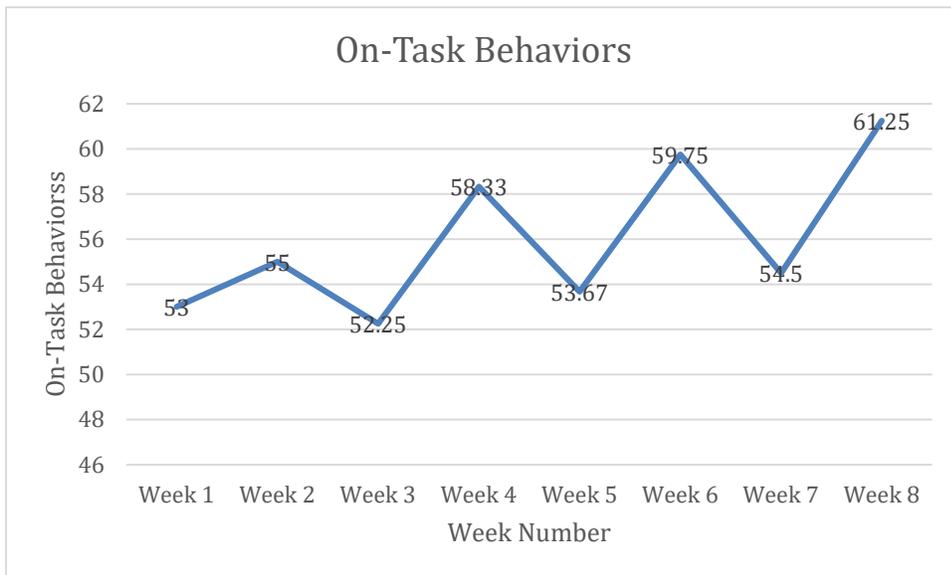


Table 2. Change of on-task behavior over four weeks of inside and outside observation shows a steady increase in behavior over eight weeks.

Analysis of redirection

One day a week, students who needed redirection were tracked by the observer. On weeks when students started the day inside compared to days started outside, on average 1.5x more redirections were needed. This data is consistent with the on-task behavior observed those same weeks. There were 26 total redirections needed across the four-week observation period of weeks starting inside. That is nine more than the total for days beginning outside.

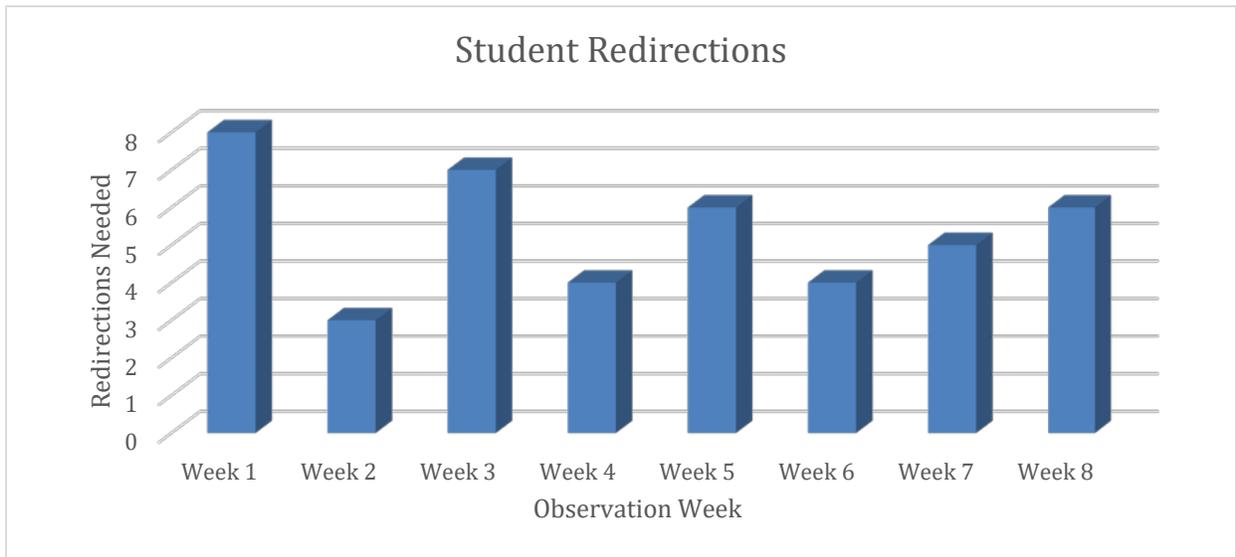


Table 3. Number of redirections needed for students to remain focused on inside days versus outside days for weeks 1-8.

Analysis of student attendance

Before beginning observations, an inordinate amount of student tardiness was observed. After tracking the morning arrival time for eight weeks, it was noted that students were arriving to school on time more frequently. Weeks when the class would start outside, a significant decrease was noted. In total, there were 16 recorded tardy marks on outside weeks compared to the 33 tardy marks on inside weeks.

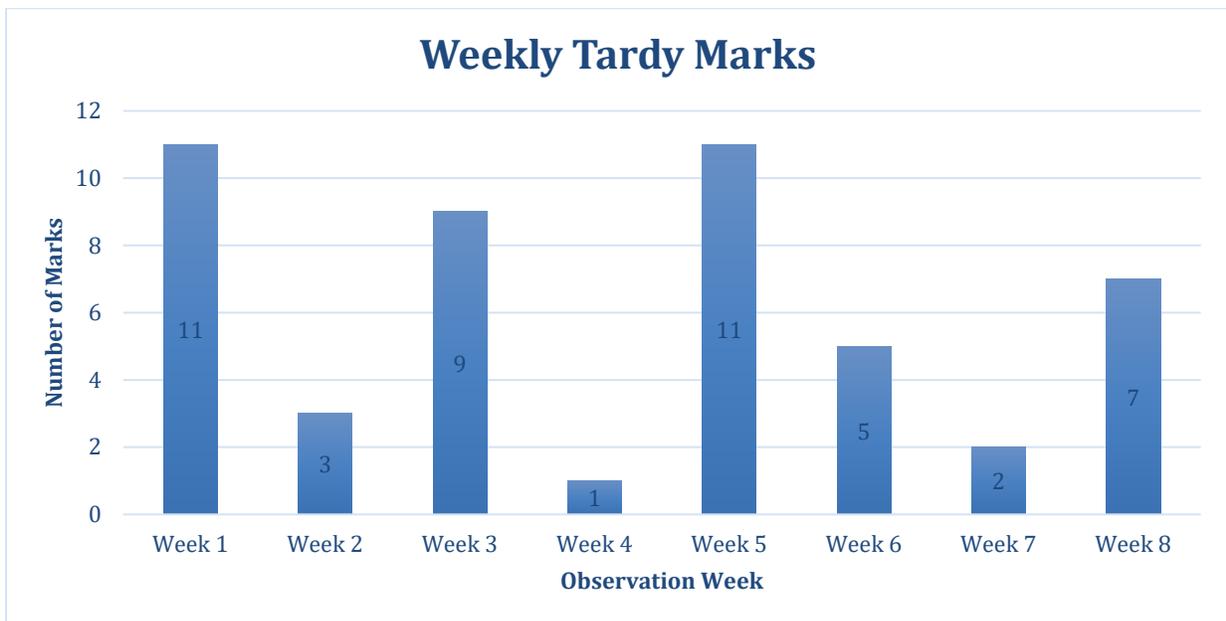


Table 4. Student tardy marks recorded over eight weeks.

Survey Analysis

When looking at survey data, it was concluded that going outside for four of the eight weeks during observation affected social relations in the classroom. At the beginning of the eight-week observation period 50% of students answered that they strongly agree that they have strong friendships at school and 4.5% strongly disagreed. When asked after the observation period, 75% said they had strong friendships at school and there were no students who said they

strongly disagree. In addition, 13.6% of students answered disagree or strongly disagree when asked prior to observation if their classmates treat them with respect at school. This percentage dropped to 0% when the second survey was given in March.

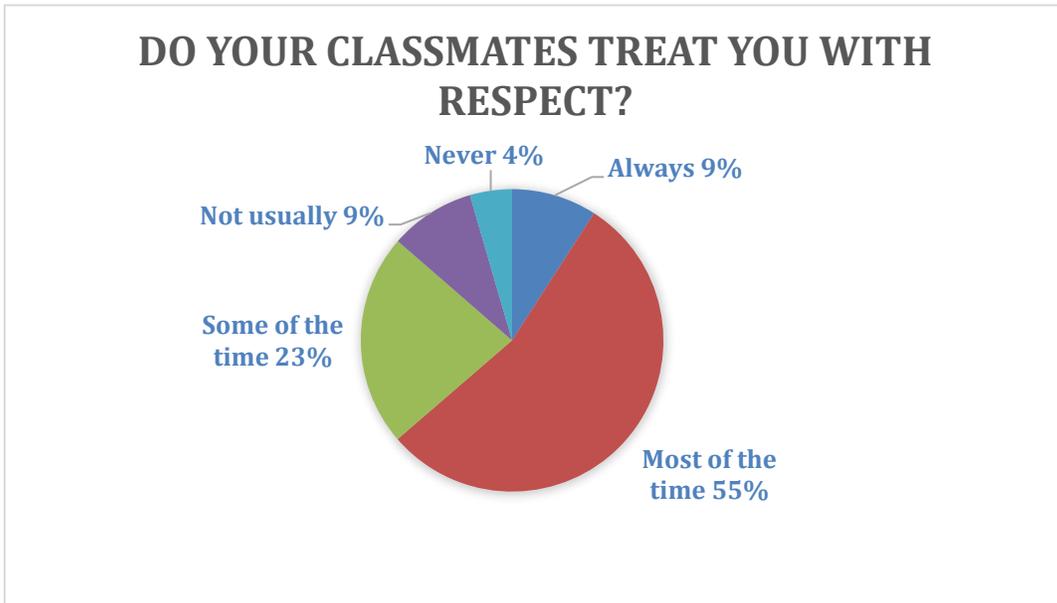


Table 5. Percent of students that said their peers treat them with respect before observation period.

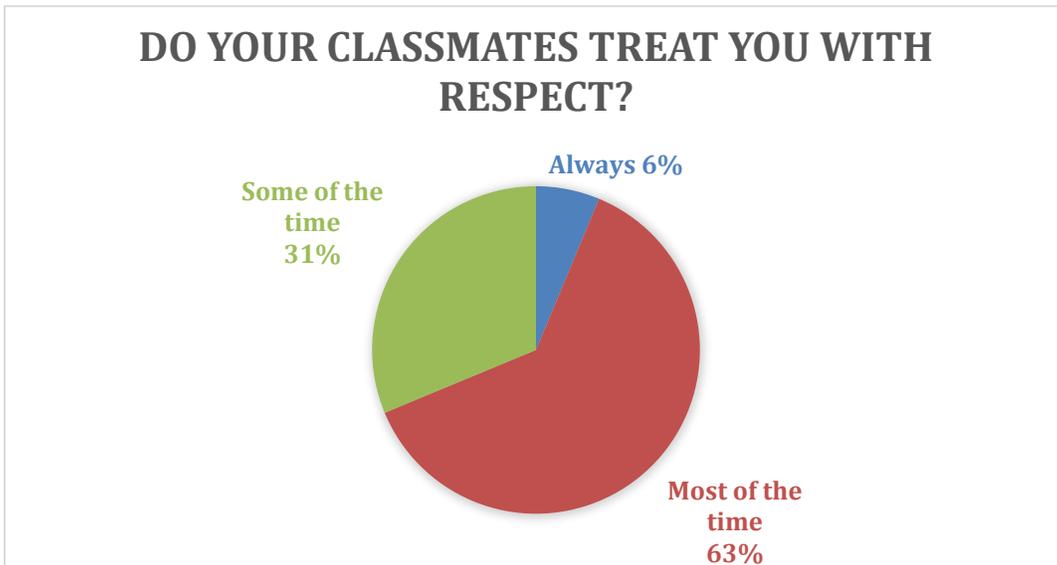


Table 6. Percent of students that say their peers treat them with respect after observation period.

Discussion

Does exposing children to the outdoor environment increase the amount of on-task behavior during a morning work period? This study found that on days when students began the school day outside, more on-task behavior was observed. Using the alternating observation technique, a slight, but noticeable difference in on-task behavior was shown between weeks that began in the classroom compared to weeks that began outdoors. Evidence was found supporting the hypothesis that when children are given a chance to explore in nature, they are more likely to arrive at school on time. Finally, according to student survey results, students in this study responded very strongly saying that school was much more enjoyable when given a chance to be outside before a work period.

As previous research states, nature can have a positive effect on children's physical, social, emotional, and cognitive development. Many of these same effects were observed during this eight-week action research study with elementary age children. In the classroom, children seemed to be more motivated. Transition time into the work period on mornings when they started the day outside decreased and students seemed more motivated to get started with their work compared to mornings when they did not go outside. There was no formal documentation, but the number of late assignments seemed to decrease as well. Social interaction also improved in the classroom. Although, not officially tracked, the teacher also observed a decrease in student disagreements and an increase in attention to detail.

Results from this action research are important in supporting the idea that schools, and parents alike, need to expose their children to the natural environment regularly. This generation of people tend to want to be indoors on their electronic devices rather than taking time to

appreciate the beauty and experience that Mother Nature provides. This study has shown that when children are taken outside and shown how interesting and exciting nature can be, they very quickly begin to enjoy it. In addition to the physical, social, and emotional benefits, nature provides many cognitive benefits as well. When students were given opportunity to be in nature they made connections to their classroom work. They were applying knowledge about botany, weather patterns, and migration to the natural environment that surrounded them. These are things that cannot be taught in the classroom, but come so organically when children are given opportunities to be in nature. Hopefully this research will reinforce the need to get kids outside more. Although this study looked only at elementary students, it can be used to springboard future research on the topic of nature and encourage others to investigate the positive effects that nature can have on overall wellness for humans of all ages.

Looking closely at the data that was collected there were a couple notable limitations. Most importantly the observations of on-task behavior did not consider students that were absent. Each week was tallied and scored the same way regardless if students were absent. This could have made a significant impact on the results and comparison of the data. For example, if two students were absent, that is 0/8 possible points for on task behavior scored. Looking back, this data should have been given a decimal value related to the number of possible points each day. Another limitation is the student tardiness. To better understand student motivation to arrive at school on time, a survey should have been given on a weekly, or even daily, basis. This would have ruled out other reasons why students were tardy and would have more accurately reflected the student motivation factor to arrive on time to school. As it is, student tardiness may be due to weather conditions or several other factors that students had no control over.

Student social interaction data that was collected using student surveys shows an increase in student relationships and respect for one another. There could be several factors that attribute to this outcome other than the exposure to the natural environment. No data was collected outdoors, however one student's behavior was particularly interesting. This female student, age 10, is very independent in the classroom and often will avoid social situations when given the chance. She has little confidence and possessed low self-esteem. It was noted that when in the natural environment this particular student flourished social. She was noticing intricate details and sharing her finding with classmates. Students were going to her with questions which she confidently engaged in conversation about. Not only did this student benefit from this experience, but her classmates began to recognize a strength in her that would have otherwise gone unnoticed.

Data which looked at time spent outdoors and its impacts with on-task behavior did not account for other variables such as physical activity, temperature, or daylight. These factors may have played an important role in student motivation, social relations, or behavior in the classroom. Finally, the student survey may not have accurately reflected student social relations and perception of on-task behavior as well as it could have. With more specific questions, the observer could have focused on one outcome with the survey, rather than the three general outcomes social relations, academic achievement, and enjoyment at school.

“Can we keep going on these walks? It's like way better than watching Netflix, because it's live and you're right there.” commented one of the students who was observed. Judging by this comment, several others like it, and student responses on the survey, this group of students really enjoyed going outside before school. Reflecting on the beginning of the study, the observer notes having six students asking if they could skip the walks. They were thinking of ways they could

clean the classroom, do extra school work, or volunteer in other classrooms during the walk. Initially, the students didn't want to go outside before beginning the school day. By the end of the eight weeks, these same students were upset when they were told they were going on our last walk for a while. Their opinions about the natural environment changed so quickly!

Looking ahead, there are multiple directions that future research could go. With fewer schools being built where the natural environment is available (Bell & Dymont, 2008) how much of the natural environment is needed to simulate the same effects if elements were brought to the students, rather than students being brought to nature? It is my thought that urban school settings with less and less green space available need to consider bringing the outdoors in to the classroom. Secondly, I believe that research needs to look closer at the older population of people. Could nature provide a way for parents to reconnect with their children? Is there a connection between society's social disconnect and a decreased compassion for the natural environment? I hope that our society can use nature as a reminder to "unplug" once and a while and focus on the values and beliefs of past generations. My personal interests lie in what I can do in my own classroom. This study provided me with useful information that I will continue to practice with my students. I need to find ways to bring out the strengths of every child which means trying new things and thinking outside the box when planning curriculum. When it is possible, students will start the day outdoors. I will try to provide more opportunities for exploration and application related to learning that is taking place in the classroom. Students responded that school is much more enjoyable when they are given time to be outside. I want school to be enjoyable and want to nourish the opportunity to promote learning. Other things that I would like to research with students is does the temperature and the weather truly have an impact on students behavior or can I find a way to get students enjoying the outdoors year-

round? Whether you are a parent, teacher, volunteer, daycare provider etc., I hope this research encourages you to get your children and yourself outdoors as often as possible!

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Appendix A

Dear Families,

As some of you know, I am also currently a student at XXXX working towards a master’s degree in Montessori Education. To better educate myself on the best practices for teaching in the Montessori environment, I will be conducting an action research project. The children in my class will participate in research that will allow them to receive outdoor instruction and/or movement activities with the hope that it will not only increase their knowledge of the outdoors, but that it will also improve their ability to focus and stay on task within the classroom. Throughout this period, you and your student may be asked to fill out surveys to help gather general information. Individual and whole group observations will also be conducted in and outside of the classroom.

During this research project, students will be observed confidentially with no information related directly to the children. There is no financial obligation to participate in this study and your child will be at no risk of physical, mental, or psychological strain. It is my hope that by increasing my students’ exposure to the natural environment, their overall well-being will improve as well as their ability to stay on task in the classroom. Participation is voluntary and you can decide at any time to withdraw your consent. Results from this study will conclude with the 2017-2018 school year and a summary of the results will be available upon request.

If you have questions about the research procedure you can contact:

University Program Supervisor
Name of University and Details

University Professor
Details Provided

Thank you,

– E2 Teacher

Name of school

I _____, give Teacher permission to collect and use data about my child my child _____ through action research at XXXXX

Date: _____

Signature: _____

Appendix B

Mr. Mitch's Survey Action Research Survey

1. Do your classmates complete their work on time?
2. Are you focused on your work while at school?
3. Do you have strong friendships at school?
4. Are your classmates focused on their work while at school?
5. How much time do you spend outdoors while at home?
6. Do you enjoy school more when we go outside before work periods?
7. Do your classmates treat you with respect at school?
8. Do you enjoy being at school?

Appendix C

Date: / /	Time of Observation						Work Comments/Observations
	9:30	9:35	9:40	9:45			
Student Initials							
EB							
DB							
VB							
QB							
RD							
AF							
CI							
SL							
NL							
FL							
AM							
HM							
TM							
IM							
WP							
RP							
SP							
GS-M							
LS-H							
EW							

Key		
O=On-task	P=Using work as a prop	A=Absent
G/R=Giving or receiving help	W=Wandering/Interfering	T=Tardy
C=Choosing Work	B=Behaving Disruptively	R=Out of room