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Meghan Best
St. Catherine University

Claire Dickinson
St. Catherine University

Courtney Hugstad-Vaa Leer
St. Catherine University

Molly Kalina
St. Catherine University

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Meghan M. Best, Claire L. Dickinson, Courtney J. Hugstad-Vaa Leer, & Molly K. Kalina

St. Catherine University

St. Paul, Minnesota

Advisor: Dr. Cara Rieckenberg

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Abstract

This paper explores the impact teaching core curricula outdoors has on primary aged students' academic achievement. A four-week study was conducted in eight primary aged classrooms found in four Minnesota public schools. The study, featuring students in kindergarten, second grade and third grade, was conducted in both mainstream classrooms as well as gifted and talented classrooms. The study compared students' academic achievement after being taught core curricula in the outdoor classroom to their peers in a control classroom that received the core instruction inside. The experimental design of the study included various forms of qualitative and quantitative data including pre- and post-assessments, anecdotal inventories and checklists, and Fountas and Pinnell benchmark assessments. Due to the varying degree of correlation amongst the classrooms, the results of the study were inconclusive. There proved to be a stronger connection to teaching curricula outdoors in mainstream classrooms compared to those in gifted classrooms. It is suggested that teachers begin to implement core instruction outdoors alongside traditional indoor instruction.

Keywords: outdoor classroom, academic achievement, outdoor learning

In today's world of education, the use of various forms of technology is a prevalent and promoted topic. So much so, that other teaching tools, like the great outdoors, are often pushed aside because there simply is not time. While technology has made education more productive and global, it also has its downsides. One of these drawbacks is the fact that students are spending less time in nature. Some experts, such as Richard Louv, argue that technology receives too much time and emphasis in young people's lives. He poses the thought of how different our lives could be if we spent as much time in nature as we do immersing ourselves in technology (Louv, 2012). Louv (2008) argues that this 'nature deficit disorder' has a negative impact on children's academic ability, behavior, and healthy lifestyle (Louv, 2008). Not only are children spending the majority of their time indoors at school, but they often go home and spend evenings sitting inside in front of the television, shooting hoops at the gym, or completing homework at the dinner table (Louv, 2008, 2012). While teachers have no control over the amount of time children spend outdoors beyond the school day, they can work to incorporate outdoor learning into their everyday curricula.

As academic, behavioral, and social requirements for students continue to increase, educators must find ways to assist students in all areas. One way to facilitate student learning is through the implementation of outdoor education. However, with common core requirements, standards-based assessments, and high-stakes testing, there is very little time for teachers to implement any new initiatives. One positive facet with outdoor education is educators can utilize the outdoors in their everyday curricula. Outdoor education can be defined as the integration of authentic learning experiences and learning by doing while using the outdoors as the classroom (Broda, 2007). Outdoor education is considered to be "experimental, hands-on

learning in real-life environments through senses, e.g., through visual, auditory, and tactile means, improving students' learning and retention of knowledge as a result" (Palavan, Cizek, & Atabay, 2016, p. 1885). Based on these definitions and descriptions, outdoor education can take place during any subject or curricula area.

Research has shown the benefits of incorporating outdoor learning for students' academics, behavior, and social skills. Studies by the American Institute of Research (2005), Bartosh, Ferguson, and Taylor (2006), Ernst and Monroe (2004), and Lappin (1984), show learning outdoors benefits students' academic grades and test scores, improves behavior and psychological self, and prepares students with the necessary social and career skills for their future. This study will look at the academic and behavioral impact outdoor education has for elementary aged students. Specifically, the study will analyze the change in second and third graders' reading level, fluency, and comprehension along with the difference in on-task behavior after receiving reading instruction outside over the course of four weeks. In addition, the study will examine kindergarten students' math and science understanding after receiving outdoor instruction in those subjects over the same amount of time. Finally, this study will compare students who participate in one of the four outdoor learning classrooms to students in the same grade level in a traditional classroom setting where outdoor learning did not occur during the four weeks.

Review of Literature

'Tell me, I'll forget. Show me, I'll remember. Involve me, I'll understand.' These famous words, from a Chinese Proverb, sum up the positive impact direct experience has on a learner. In classrooms all around the world, students are experiencing all three of these situations; teachers

telling, showing, and involving students. When students hear and listen to the teacher, they forget. When students are shown, they remember. It is not until they are involved in the learning process that they will understand. Students that participate in experiential learning beyond school walls show greater pride and ownership in their work, have increased engagement and enthusiasm for learning, and perform better on standardized tests (Lieberman & Hoody, 1998). In the past few decades, the Experiential Learning Theory has become popular in education (Kolb, 2014).

The Experiential Learning Theory suggests students learn best by doing, not listening or reading (Kolb, 2014). Kolb (2014) argues learning through experience and applying the knowledge from the experience is a strong educational tool. The Experiential Learning Theory also differentiates needs and strengths based on various learning styles (Kolb, 2014).

As academic, behavioral, and social requirements for students continue to increase, educators must find ways to assist students in these areas. One way to facilitate student learning in all areas is through the implementation of outdoor education. Outdoor education and learning will be defined and referred to within the contents of this literature review. The academic, behavioral, and psychological benefits of this type of learning will be discussed in detail.

The literature review will conclude by describing the impact this type of education has on students' critical life skills and career readiness aptitudes. The research describing and defining the various benefits of outdoor education, including the benefits and impact it has on student achievement will be discussed in detail in this paper.

What is Outdoor Education and Learning

Outdoor education can be challenging to define because it means different things to different people and can be very extensive. The definition of outdoor education from Broda (2007) will be referred to within this literature review and the broader context of this research and paper. The general term, 'outdoor education' integrates authentic learning experiences and learning by doing while using the outdoors as the classroom. In his book, *Schoolyard-Enhanced Learning: Using the Outdoors as an Instructional Tool, K-8*, Broda (2007) explains there are three dimensions to outdoor education. Outdoor education consists of promoting knowledge and concern for the environment, focusing on the teaching of traditional content, and facilitating personal growth through problem-solving, challenge, and adventure. In all cases, student experience and learning take place outside (Broda, 2007).

Within the concept of outdoor education lies environmental education, place-based education (PBE), and using the environment as an integrating context for learning (EIC) (Lieberman & Hoody, 1998). Environmental education places emphasis on developing citizens that are aware of and concerned about interactions of natural and built environments (Adkins & Simmons, 2002). It also focuses on the knowledge and commitment one has to identify and solve environmental problems (Broda, 2007). While incorporating similar elements of environmental education, place-based education emphasizes the value of using the local community as the focal point of learning experiences (Broda, 2007; Sobel, 2005). In a similar sense, EIC-based learning encompasses the value of learning about the environment and developing awareness while also integrating the school's surroundings to provide a comprehensive educational framework (Lieberman & Hoody, 1998). Essentially, outdoor education is the practice of using the outdoors as a tool for learning and is under the broader umbrella of experiential learning (Broda, 2007).

Outdoor education is considered to be "experimental, hands-on learning in real-life environments through senses, e.g., through visual, auditory, and tactile means, improving students' learning and retention of knowledge as a result" (Palavan et al., 2016, p. 1885). Broda (2007) explains outdoor education is not merely taking students outside for extra recess or going outside once a year to look at plants. Rather, outdoor education involves all subjects, learning styles, and types of curriculum. Students can experience the lessons instead of reading or hearing about them.

Studies, such as the ones by the American Institute of Research (2005), Bartosh, Ferguson, & Taylor (2006), Ernst & Monroe (2004), and Lappin (1984), show learning outdoors benefits students' academic grades and test scores, improves behavior and psychological self, and prepares students with the necessary social and career skills for their future. These primary benefits of outdoor education: academic, behavior and social skills will be the focus of this research. Each will be defined and supported by current literature to gain a clear understanding of the differences and benefits to students.

Academic Benefits of Taking Students Outdoors

Finland's Ministry of Social Affairs and Health claims, "The core of learning is not in the information being digested from the outside, but in the interaction between the child and the environment" (Louv, 2008, p. 205). This view of education suggests the direct impact outdoor education can have on students' academic achievement.

Environmental outdoor learning is beneficial for students because it improves their academic grades and test scores, increases attendance and positive behavior, and teaches students life skills they will need for the future (EIC, 2017). Incorporating core subjects into the environmental curriculum proves to be a beneficial way of both teaching and learning (EIC,

2017). A variety of subject areas and objectives can be taught using the outdoor education teaching method (Bunting, 2006).

Lieberman, director of the State Education and Environmental Roundtable, claims outdoor education can impact student success (Lieberman & Hoody, 1998). A ten-year report from 150 schools in sixteen states that incorporated environmental-based education, found a positive correlation in student gains in social studies, science, language arts, and math (Lieberman & Hoody, 1998). The report also noted improved standardized test scores and grade-point averages as well as increased skills in problem-solving, critical thinking, and decision-making (Louv, 2008).

Louv (2008) cited a study by Sobel that concludes students participating in outdoor education typically outperform students in traditional classrooms. Sobel cited 13% gains in passing rates of students in an environment based program in a Dallas elementary school compared to an earlier traditional class (Louv, 2008). Sobel also referenced a Portland environment-based school that showed a 31% increase of students performing at a proficient level (Louv, 2008).

Gilbertson (2006) claims, incorporating the outdoors into the academic and educational curriculum and using nature as a classroom provides multiple learning opportunities but also gives students skills and specialized knowledge. Gilbertson (2006) adds outdoor education strives to "elevate the physical, emotional, cognitive, social, and spiritual levels of the individual" (p. 14).

Research from Bartosh et al. (2006) explored the effect of outdoor learning on student achievement in core subject areas by comparing results from standardized tests in environmental

education (EE) programs and more traditional programs. Their analysis found the EE programs outperformed their comparable traditional programs. The authors concluded that a pattern or trend is shown between outdoor learning and student achievement.

EIC programs integrate multiple content areas and require students to formulate and test hypotheses, take responsibility for their learning, reflect on what they learn, and connect learning to their community (EIC 2017). All of these factor into an increase in students overall GPA (Lieberman & Hoody, 1998). In addition to this, students who participate in EIC programs score higher on standardized tests and show more cooperation and conflict resolution skills (Chawla & Escalante, 2012). It is apparent that outdoor learning has a positive impact on not only academic achievement but social learning as well.

Behavioral, Psychological and Physical Health Benefits of Taking Students Outdoors

Louv's (2008) theory, 'nature deficit disorder', as to how and why children are alienated from nature was the other basis for our research. Louv (2008) points out, nature-deficit disorder, which he defines as "the human costs of alienation from nature," contributes to a diminished use of the senses, attention difficulties, conditions of obesity, and higher rates of emotional and physical illnesses (p. 36). Outdoor education will help eliminate nature-deficit disorder and improve students', especially those with ADHD or behavior issues, focus (GVFJ, 2011). If a student is focused, s/he will have a far better chance at understanding the material (Lappin, 1984).

A 2004 study of 150 environmental education programs in the United States, as cited by American Institutes for Research (2005), states there are several positive outcomes for students' behavior such as an increase in "independence, confidence, self-esteem, focus, self-efficacy,

personal effectiveness and coping strategies" (p. 1). After ten weeks of outdoor education, surveys from parents, teachers, and students showed significantly higher gains in the relationship with peers and classroom behavior (American Institutes of Research, 2005). Today, many students are used to sitting in front of a screen instead of playing or interacting with peers, and because of this, teaching group skills and cooperation within the classroom as well as at home is very important (GVFJ, 2011).

Palavan et al. (2016) mention students tend to be more relaxed and act naturally outdoors which allows the teacher to observe them in a more comfortable environment and make a stronger connection with the students. In turn, this improves students' behavior and attitude toward their teacher (Palavan et al., 2016). The connections and relationships in a classroom are critical to student success (Responsive Classroom, 2017). Teachers and students can connect on a different level when spending time in nature and learning outdoors. That connection, coupled with the extra energy burn off, can lead to behavior improvements (GVFJ, 2011; Responsive Classroom, 2017). An article by Lappin (1984), presents evidence that students with behavior disorders experience positive changes after participating in outdoor learning. These changes include improvement in self-concept, decreases in disruptive behavior, personality adjustments, and social cohesion (Lapin, 1984).

A study out of the United Kingdom compared 48 students with emotional-behavioral issues impacting their learning and behavior (White, 2012). Twenty-four students participated in outdoor education programs, and twenty-four did not (White, 2012). After taking part in the outdoor education activities, which included trust-building, perseverance, and communication exercises such as camping, canoeing, rock climbing, and hiking, there was qualitative and

quantitative data to suggest the students in the outdoor education activities had a far more significant improvement in their self-concept, relationship with peers, and positive behavior (White, 2012). Quantitatively, the students were given a 150 question preliminary test and post-test in regards to their self-concept. The data from these tests showed a significant improvement after the students completed the outdoor intervention (White, 2012.). Qualitatively, data was collected through observations and interviews about students ability to work in groups and level of trust (White, 2012.) The data from the interviews showed considerable increases in students level of trust, cooperation, and self-concept: 100% said they trust their group members better, 88% said they increased their ability to regulate their emotions, 86% noted an increase in self-confidence, 64% said they were better able to read others' emotions and needs, and 75% experienced positive gains with their family (White, 2012). As being successful in school and life require students to be able to work well together, these changes that students' noted are advantageous in the classroom and their future careers (Responsive Classroom, 2017). Outdoor education improved students' relationships with each other and their ability to behave positively (Gill, 2014).

Gill (2014) cites research to prove students with ADHD along with neuro-typical students have improvement with mental health and emotional regulation after spending time outdoors. In turn, the increase in mental health stability and emotional regulation leads to the students' ability to attend school each day and behave well while staying focused (Gill, 2014). In addition, research has been done at the University of Illinois to prove exposure to natural settings can reduce attention deficit symptoms in children (Barlow, 2004). Kuo and Taylor, co-authors of the study, surveyed over 400 parents of children with ADHD or ADD across the United States

(Barlow, 2004). These children came from a variety of races, economic statuses, regions of the United States, and living situations, but the results were very consistent for everyone: "green time" has a significant impact on the children's symptoms (Barlow, 2004). Barlow (2004), explained that Kuo and Faber Taylor used the internet to collect data from parents who completed various activities and tasks with their children both indoors and outdoors. The data showed using nature is a beneficial way to manage ADHD symptoms, especially for the 10% of children who have symptoms that do not respond to medication (Barlow, 2004). Kuo and Faber Taylor continued to analyze the data in a later study to find that green play settings, such as parks or backyards, reduced ADHD symptoms more than human-made or indoor play settings (Yates, 2011). They found routine play in nature is more beneficial for children's mental health, specifically concentration and impulse control, than routinely playing indoors (Yates, 2011).

As mentioned above, there are many psychological health benefits involved in exposing children to nature. In a study conducted by Maller (2009), she used qualitative data (interviews and observations) with educators and principals regarding students and their improved mental health through contact with nature. Children's overall mental well-being and health significantly affect their ability to learn (Maller, 2009). Students with mental health issues tend to have difficulties with learning and numerous studies have indicated contact with nature may help lower stress and improve overall mental health (Louv, 2008; Maller; 2009). In today's modern age, students are exposed less frequently to the outdoors, and schools are becoming increasingly important in their pivotal role to expose children to nature as the bulk of opportunities students have to be outdoors tend to happen in the school setting (Maller, 2009).

Not only are there psychological benefits to outdoor education, there are also physical benefits. Studies show on average children spend less than one hour a day outside (Klasky, 2014). That is less than free-range chickens or prison inmates. In the past 30 years, the amount of time children spend outdoors has decreased by half, while obesity rates have tripled (Klasky, 2014). Childhood obesity has increased and in some studies, directly relates to the hours of television watched; however, there has also been an increase in the amount of organized team or individual sports for children (Louv, 2008). The missing link appears to be children not having as much unorganized play in nature. When children are outside, they often tend to be more physically active taking part in a variety of activities which can help lessen the likelihood of a sedentary lifestyle (Louv, 2008). In his novel, Louv (2008) describes that spending time in nature is not leisure time; rather it is an essential investment in our children's health.

Benefits of Outdoor Education on Students' Critical Life Skills and Career Readiness Aptitudes

Not only do students have to be successful in their K-12 educational experience, they also have to be productive, contributing members of society (Responsive Classroom, 2017). To be prepared for their future careers, students must learn certain life-skills while still in school. Research by Monroe, Randall, and Crisp (n.d.) shows environmental education and teaching outdoors improves' students ability to think critically. One of the studies that examined the relationship between outdoor learning and students' critical thinking skills took place among 400 high schoolers in Florida (Ernst & Monroe, 2004) The study broke critical thinking skills into the following categories: interpretation, analysis, evaluation, inference, explanation, and self-regulation (Ernst & Monroe, 2004). The study tested the improvements in these specific

behaviors by gathering both quantitative data, such as GPA, test scores, and the Cornell Critical Thinking Test, and qualitative data from survey responses and discussions (Ernst & Monroe, 2004). Both types of data found overall increases in students' ability to think critically, according to Ernst and Monroe (2004). They also noted that by implementing a place-based EIC model of outdoor education, students could improve their ability to think deeply and analyze valuable information (Ernst & Monroe, 2004). This in-depth type of thinking is vital to college and nearly all future careers the students may have (Trilling & Fadel, 2012).

Another important skill for life is the ability to collaborate and cooperate with others (Trilling & Fadel, 2012). Research by Cooley, Burns, and Cumming (2016) shows students participating in outdoor education programs report higher levels of group work skills, attitudes towards group work, and group work self-efficacy. In their research, the students participated in a pre-course and post-course questionnaire and interview about their experiences and attitudes with working as a group (Cooley et al., 2016). The increase in skills related to effective group work is important because, in future education and most careers, students will have to work as a group to complete projects, give presentations, and perform job-related tasks (Trilling & Fadel, 2012). Many interpersonal skills are not specifically taught in elementary and secondary education, but they are still vital for success in life (Trilling & Fadel, 2012). Similarly, research by Lieberman and Hoody (1998) state students in EIC models of outdoor education show a 98% better ability to work in groups and 94% stronger communication skills.

Ninety-seven percent of students who participate in outdoor education, specifically using the previously mentioned EIC model, showed greater proficiency in problem-solving skills and strategic thinking (Lieberman & Hoody, 1998). The ability to make quality decisions and solve

problems effectively is essential in the workforce as employees are often forced to think at high levels to complete their tasks (Trilling & Fadel, 2012). By participating in an integrative outdoor education program, students will be better prepared to be successful employees and coworkers.

Conclusion

As noted throughout the content of this literature review, effectively implementing outdoor education has many educational and psychological benefits as well as the power to create 21st-century learners. Building successful learners who reach their full potential and build a relationship with nature are significant aspects of environmental and outdoor education (Broda, 2007). Outdoor education can promote student achievement: academically, socially, emotionally, and physically. It also increases the likelihood of future success in life-skills and careers. Effectively implementing environmental education requires educators to connect curriculum to real-world situations, thus increasing student engagement.

One gap in the literature was the limited sample sizes of some studies. Greater sample sizes would have provided more accurate results. Having numerous studies regarding the effects of nature on students and learning would also add to the literature review. The variety of benefits from the result of effectively implementing environmental education were very apparent amongst the research. As Louv (Korbey, 2013, para. 4) said, “If you really want true education reform, we’ll have ‘No Child Left Inside’”.

Methodology

The Design

The experimental design of this study looked directly at incorporating the outdoors into the school day and the effects it had on kindergarten students’ math and science achievement as well as second and third-grade students’ reading growth. While kindergarten students were taken

outdoors for math and science instruction at a minimum of three days per week, students in the second and third-grade classrooms participated in thirty minutes of independent reading in an outdoor setting. At the kindergarten level, participant observation and interviews were used in addition to classroom observations, teacher and student testimony, and a quantitative assessment. By using data collection of artifacts and observational data, this study experimented with outdoor education and the effects it had on student reading progression with second and third-grade students.

In all cases, data was compared with data from other classrooms of similar grade levels who did not frequently go outdoors for curriculum instruction, specifically math, reading, and science. At the second and third grade level, data of fluency (words per minute), Fountas and Pinnell (F&P) reading growth (accuracy, level, fluency and comprehension) and behavioral observation of students by the teacher when the class was reading independently for thirty minutes both indoors and outdoors was collected and analyzed over a four week period (Heinemann, 2014).

Kindergarten students completed both a pre and post assessment to determine academic growth in math and science. Students were given a pre-assessment to examine his/her ability to identify shapes. Students were also given fifteen objects to sort based on living and nonliving attributes. After completing the sort, they were interviewed and asked the reasoning. The answers were then recorded.

Setting and Subjects

For the reading component of this study, the population of students was gathered from classes at three different schools all within the same school district. There were two third-grade

classes and one second-grade class. Six students from each class, three boys, and three girls were selected by each classroom teacher. Teachers used the Fountas and Pinnell (F&P) benchmark assessment to assist in choosing a high, middle, and low-level reader from each gender. The students selected were an accurate representation of the district's student population. In total, eighteen students spread across two different grade levels and three different schools participated in the study. Data was compared to another grade level class in the same school that did not frequently go outdoors for curriculum instruction. It should be noted one of the participating third-grade classes, that frequented the outdoors for instruction, was entirely made up of students who met specific criteria to be part of a gifted and talented program. The school district is located in a rural, suburban setting in Minnesota with easy access to outdoor facilities for utilization with students.

The kindergarten class participating in this study came from a different school district located in rural south central Minnesota. The students chosen to participate in the study included three females and three males, ages five and six. This sample was an accurate representation of the student population. The sample consisted of a cross-section of the classroom which included second language students. A similar classroom was used as a control classroom. The control classroom taught the same standards but did not utilize the outdoors for their learning.

Data Collection

Multiple instruments were used to collect data in all four classrooms. The second and third-grade classrooms used an anecdotal engagement inventory (See Appendix A) to track students on task behavior and engagement during independent reading. This inventory was a

formative way to determine whether students responded positively to reading outdoors as opposed to in the classroom.

The second and third grade classrooms, also utilized the Fountas & Pinnell (F&P) Benchmark Assessment System which followed students Fountas and Pinnell reading level growth after four weeks of implementation (See Appendix B). This system is comprised of a series of texts, leveled A-Z, that are used to determine a student's current guided reading or instructional level. The texts are leveled based on factors related to the level of support and challenge a reader may experience in the text (Heinemann, 2014). The data received determined whether student comprehension, fluency, accuracy, and overall reading level increased more significantly than the control group.

A third tool, for the second and third grade students, was the grade level fluency passages (See Appendix C). These were administered to students twice per week; once indoors and once outdoors. Words read per minute were recorded. Fiction and nonfiction were alternately used. The passages were used to track student fluency progress each week during the four weeks of implementation (See Appendix D).

In the kindergarten classroom, pre and post-assessments were used with an observational checklist (See Appendix E). Students were asked to sort fifteen objects based on living and nonliving attributes. After the sort, students were interviewed by the teacher and asked to explain why they classified the objects the way they did (See Appendix F). Their responses were recorded and examined to check understanding of living and nonliving. Subjects also participated in a Shape Recognition Data Assessment (See Appendix G) where they identified

two-dimensional and three-dimensional shapes. Students completed this assessment before outdoor instruction and again at the end of the study.

The Study

The study took place over four weeks. Before beginning the study, passive consent letters were sent to all families in each of the four participating classrooms.Teachers selected students based on criteria previously mentioned.

Second and third grade data collection. The anecdotal engagement inventory was completed by the classroom teacher twice per week during each of the four weeks. It was completed during independent reading time, once outdoors and once indoors each week. Every three minutes for 30 minutes the teacher observed and recorded the six participating students reading behaviors. The teacher marked whether students were on task, talking, looking through the pictures, moving, eyes wandering, playing, resting, or changing books. Each day the inventory was completed, the teachers calculated and recorded the percentage of time on task for each student.

The Fountas & Pinnell (F&P) Benchmark Assessment System was completed a week before data collection began and immediately at the end of the four weeks of data collection. The benchmark system specifically tracked comprehension, fluency, accuracy, and overall reading level. Teachers implemented this assessment with fidelity as indicated with the F&P methods.

Fluency passages were given to students twice per week with words per minute recorded. The passages were new to students each time, alternating between fiction and nonfiction and whether the passage was read by students indoors or outdoors. Fluency rates were collected and recorded to determine which setting students read an average of more words per minute.

At the end of the four weeks, all the data was collectively analyzed to determine student growth. The growth of students Fountas and Pinnell level was compared to the control group of students in the same grade. The comparison of student engagement and fluency rate when outdoors and indoors was done solely with the classes participating in outdoor learning.

Kindergarten data collection. The kindergarten students participated in daily outdoor lessons designed to teach Minnesota State Standards in math and science. The lessons were adapted from the current curriculum being taught at the school and enhanced with outdoor learning and observations. Students were asked to complete activities, observations, and lessons outdoors in addition to the indoor activities outlined in the curriculum.

Analysis of Data

The purpose of this study was to determine the impact outdoor learning has on primary aged students' academic achievement in core content areas. Regular opportunities for outdoor learning were implemented while integrating core curriculum. The research design was experimental. Artifacts, anecdotal observations, interviews, and teacher-made assessments were used to gather information about students academic gains in reading, math, and science. The study was completed over a four week period with students.

The subjects for this study were primary aged students from four public elementary schools in Minnesota. The study consisted of kindergarten students at a rural school in southern Minnesota, as well as second-grade students from and third-grade students from three different elementary schools within a second tier suburban school district of the Twin Cities. A total of eight classes participated in the study during the 2017/2018 school year. As evidenced in Table

1, the sample size was forty-eight students. Twenty-four of the students were female and twenty-four were male.

Table 1

Demographics

Grade Level	*Males*	*Females*
Kindergarten	*6*	*6*
Second	*6*	*6*
Third	*12*	*12*

Teachers analyzed the reading level, accuracy and comprehension data of six students in each class with varying reading abilities according to the Fountas and Pinnell reading assessment. Students were assessed before and at the end of the four weeks of outdoor learning. The rate of improvement was then compared to similarly performing students in a control class of the same grade level at the same school. The control classrooms did not implement outdoor learning during the four weeks of research.

Fluency data of students in the outdoor learning classroom was also analyzed. words read per minute data was recorded with two fluency passages per week, one indoors and one outdoors. The average of students words read per minute indoors was compared to their average of words read per minute outdoors.

Finally, a on-task behavior was evaluated and recorded via a teacher observation checklist. Only participating students were observed. Observations were reviewed and re-categorized by the researchers until all the researchers validated all the codes in each category. The results of coding were transcribed and given to an external source for a final review to assure triangulation. The percentage of indoor learning on-task behaviors were compared to the

percentage of outdoor learning on-task behavior over the course of the four weeks to determine if the setting had a positive or negative impact on students on-task behavior.

The science data collected was centered around student's ability to sort and identify objects based on the criteria of living and nonliving. Students were assessed before and after a four week period of daily instruction incorporating outdoor learning. The rate of improvement in students' ability to recognize and defend reasoning to sorting was compared to a control classroom with similarly performing students who did not participate in outdoor learning related to Minnesota Kindergarten State Science Standards.

The math data collected was based on student's ability to identify shapes before and after participating in corresponding outdoor learning in mathematics. The data was compared to the same sample of control students in a neighboring classroom. Researchers analyzed the percentage of correct answers before and after instruction based on the teacher made assessment and interview questions.

The question this research study addressed, to what extent will primary school students' math, reading, and science performance benefit from incorporating outdoor learning in daily classroom instruction, dealt with the academic impact of teaching curriculum outdoors. To answer this question, the researchers focused on math, science, and reading in four classrooms, each in a different K-5 elementary school. To begin the study, researchers took baseline data in either the form of a Fountas and Pinnell reading assessment or a teacher created pre-assessment. Then, the researchers collected data for four weeks while students learned curriculum outdoors. In the subject of reading, students' words per minute reading fluency were taken twice weekly, once indoors and once outdoors. In the subjects of math and science, anecdotal observations

were gathered weekly during the outdoor lesson. After the four weeks, the students' average words per minute inside and average from outside were compared. Students were also given the Fountas and Pinnell reading assessment for a second time to check for any change. The results of students who learned outside were compared to a control class of students who learned inside. In math and science, students were given a post-assessment to gauge mastery of given standards.

The subsequent question this research study addressed was related to the impact outdoor learning has on students' on-task behavior while participating in curriculum outdoors. To answer this question, the researchers used an observation sheet twice a week (once indoors and once outdoors) for four weeks to determine the percent that students were on task during independent reading time. Kindergarten students were also observed to determine whether learning in the outdoors promoted more time on task. This data was anecdotal as activities and lessons had different expectations depending on the objective being taught.

Data Findings from Second and Third Grade Regular Education Classrooms

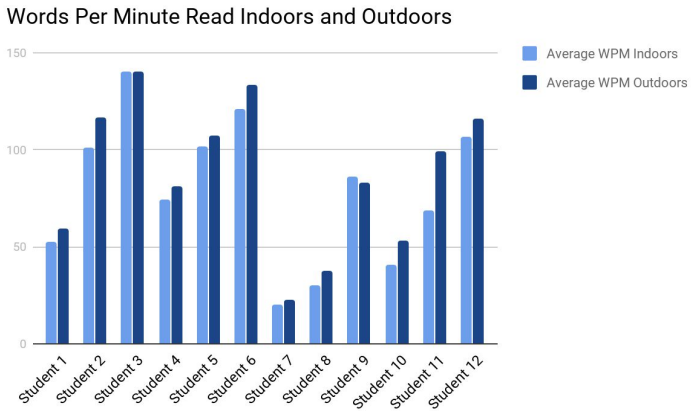

Figure 1. Second and third grade reading engagement percentages

As noted in Figure 1, after participating in four weeks of outdoor learning during reading curriculum, results show that eleven out of twelve second and third-grade regular education

students increased their average words per minute read while reading in an outdoor setting as opposed to an indoor environment.

Table 2

Comparison of F&P Level increase from 3rd grade Control Class, which learned indoors, to 3rd Grade Participating Class, which learned outdoors. Both classes are regular education classes.

3rd Grade Control Class (Learning Indoors)	F&P Levels Increased in Four Weeks	3rd Grade Participating Class (Learning Outdoors)	F&P Levels Increased in Four Weeks
Student 19	2	Student 1	2
Student 20	1	Student 2	1
Student 21	0	Student 3	1
Student 22	1	Student 4	2
Student 23	1	Student 5	2
Student 24	1	Student 6	4
Average	1	Average	2

Table 3

Comparison of F&P Level increase from 2nd grade Control Class, which learned indoors, to 2nd Grade Participating Class, which learned outdoors. Both classes are regular education classes.

2nd Grade Control Class (Indoors)	F&P Levels Increased in Four Weeks	2nd Grade Participating Class (Outdoors)	F&P Levels Increased in Four Weeks
Student 25	3	Student 7	3
Student 26	2	Student 8	3
Student 27	0	Student 9	1
Student 28	2	Student 10	1
Student 29	2	Student 11	2
Student 30	0	Student 12	3
Average	1.5	Average	2.17

As noted in both Tables 2 and 3, students in the participating classrooms increased their F&P reading level more than the students in the control classrooms who did not go outside. All twelve students in the participating classrooms went up one level or more in the assessment from September to October. Third grade participants, on average, doubled their F&P level growth, when compared to their counterparts in the control classroom. Second grade participants, on average, achieved a growth of .67 levels more, when compared to 2nd graders in the control classroom.

Students in the second and third grade participating classrooms showed a higher average number of levels increased on the Fountas and Pinnell system than their peers in the control classroom that did not participate in outdoor learning. Table 2 shows the third grade participating students average increase was 2 levels as opposed to the control classroom who had an average increase of 1 level. Table 3 shows students in the second grade participating classroom grew an average of 2.17 levels compared to their peers in the control classroom that grew an average of 1.5 levels.

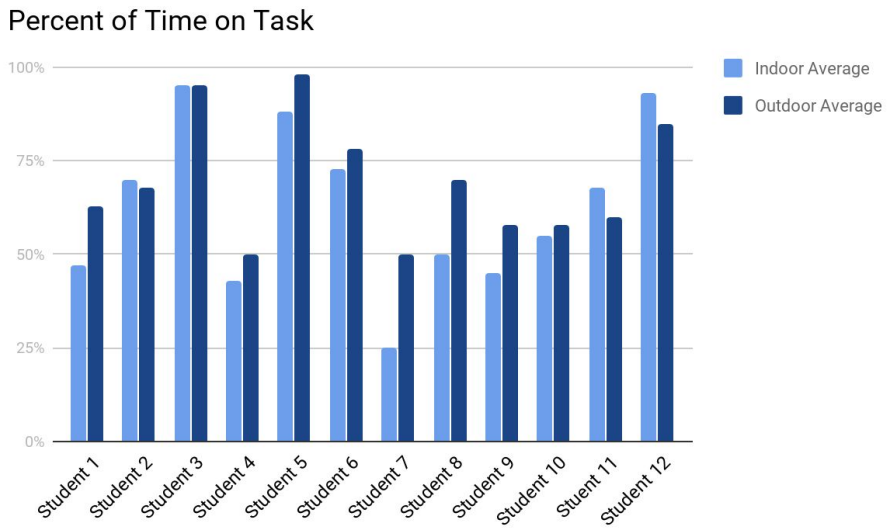

Figure 2. Second and third grade fluency (words per minute) data.

After participating in four weeks of outdoor instruction of reading curriculum, results show that nine out of twelve second and third grade students participating in the research maintained or showed improvement in their percentage of time on task while doing independent reading outdoors compared to indoors as noted in Figure 2. Several variables impacted this data. For example, there were several days with cold and windy weather outside which led students to spend some of their reading time off-task while outdoors. There were also classes playing outdoors for recess which caused distractions. It is important to note that the researchers and educators have no control over students' home lives which can also affect their academic and behavioral performance. In addition, because this study was completed in the first couple of months of the school year, not all students were comfortable with the routines of school, both academically and behaviorally.

Data Findings from a Third Grade Gifted Classroom.

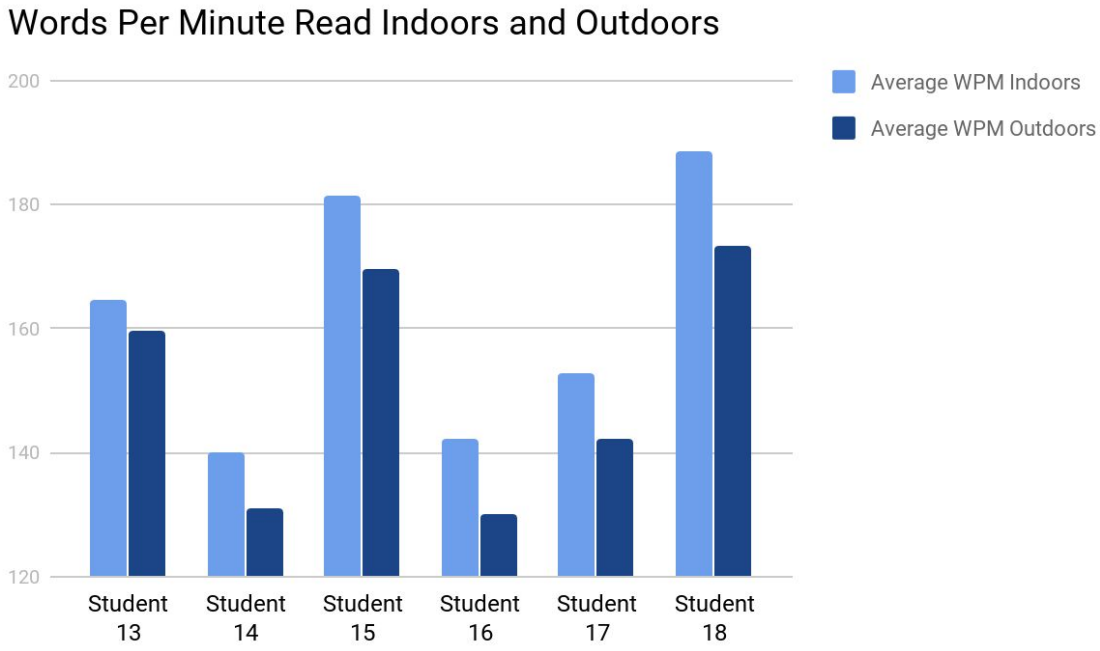

Figure 3. Third grade gifted class fluency (words per minute) data.

There are significant results as 100% of students performed better on fluency assessments inside compared to the outside. According to Figure 3, gifted students have improved fluency (words per minute) on fluency assessments when assessments are conducted in the classroom versus the outdoors.

Table 4

Comparison of F&P Level increase from 3rd grade Control Class, which learned indoors, to 3rd Grade Participating Class, which learned outdoors. The control class is a regular education class. The participating class is a gifted class

3rd Grade Control Class (Learning Indoors)	F&P Levels Increased in Four Weeks	3rd Grade Gifted Class (Learning Outdoors)	F&P Levels Increased in Four Weeks
Student 31	2	Student 13	6
Student 32	1	Student 14	2
Student 33	0	Student 15	1
Student 34	1	Student 16	2
Student 35	0	Student 17	4
Student 36	1	Student 18	2
Average	0.83	Average	2.83

As noted in Table 4, students in the third grade gifted class increased their F&P reading levels more than the students in the control class who did not go outside. Students in the third grade control class increased on average of 0.83 reading levels over the four week period. While the gifted third grade class, who had reading instruction outdoors, on average, increased their reading level by 2.83 levels in four weeks. The gifted third grade class, on average, increased their F&P reading level two levels more than the control class who did not participate in any reading instruction outdoors over the four week period.

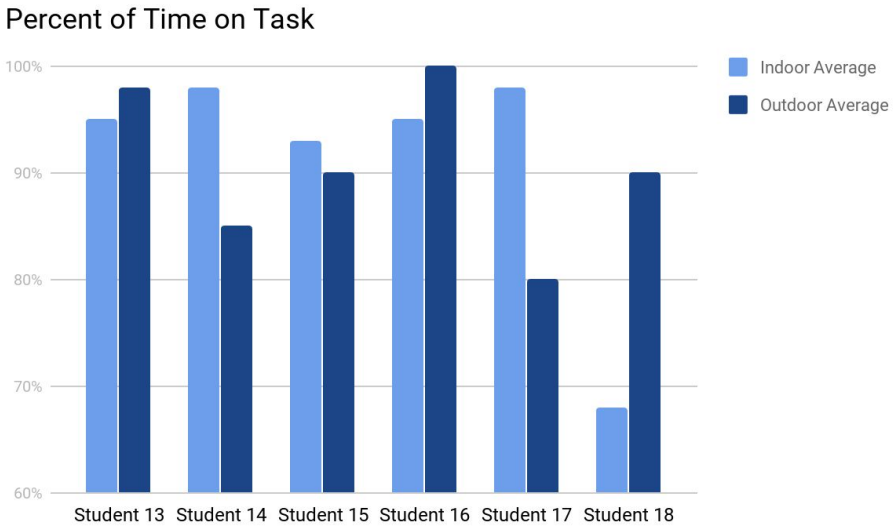

Figure 4. Third grade gifted class reading engagement percentages.

As noted in Figure 4, there was not a significant variance in time on task as to whether students were reading indoors or outdoors, except the last two students. Exactly half of the students were more engaged indoors while the other half were more on task when outdoors. Overall, on average, students were on-task while reading 91% of the time when inside and 90% of the time when outside. Variables that may have possibly altered the data include: the time of day students read outdoors, what was happening around students, the weather, and the lack of reading outdoors experience students had before this study.

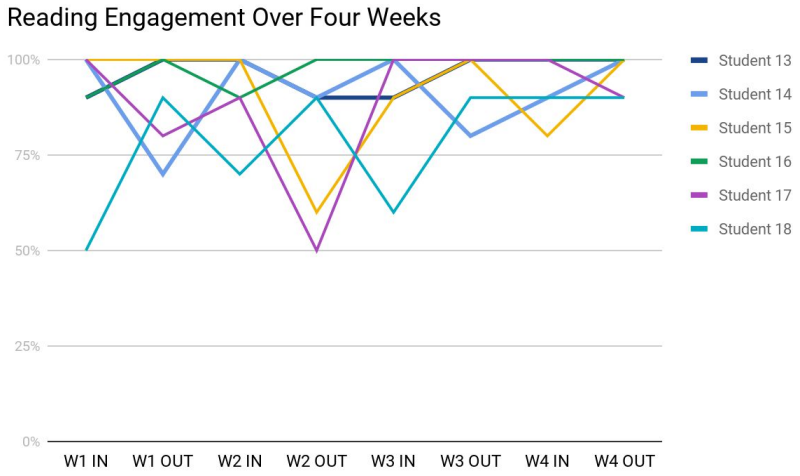

Figure 5. Third grade gifted class, reading engagement percentage across all four weeks, both indoors and out. W1 IN stands for week one inside and so on.

While the lines in Figure 5 become slightly jumbled and unclear, the area to note is that by week four, all students were engaged at least 80% of the time. After four weeks of reading outdoors, at a minimum of three days per week, student engagement did increase.

Data Findings from a Kindergarten Classroom

After completing four weeks of outdoor learning in the kindergarten classroom, results show an increase in mastery in Minnesota science standard K.2.1.1.1 and K.1.2.1.1. Five of the six students were able to sort the objects into two piles based on living and nonliving attributes after completing the outdoor curriculum. This data was compared to the beginning of the unit when none of the six students were able to sort based on those attributes. This data was significant compared to the control classroom where there was no real growth in this area. During the post-assessment, students in the control classroom sorted the objects similarly to how they sorted them at the beginning of the experiment. When asked why they sorted the objects the way they did, students in the control classroom had a hard time explaining their reasoning.

Responses varied between, “I don’t know”, to “I made a pile of all the toys”. In contrast, students who received instruction in the outdoor setting were able to support their sorting answers with attributes of living things versus nonliving things. Responses included, “I put these things here because they talk, breathe and grow”, “Those are things that living things do”, and “These things move, breathe and are a part of life”.

Table 5

Pre-test and post-test scores for shape identification. Red indicates scores of students who received instruction outdoors. Blue indicates scores of students who were in the control classroom and did not receive instruction outdoors.

	1	2	3	4	5	6	Avg.	1	2	3	4	5	6	Avg
Pre Assessment	4	3	3	5	4	4	3.8	5	7	1	7	3	4	4.5
Post Assessment	5	4	5	5	5	5	4.8	6	7	2	8	4	5	5.3

In the area of mathematics and shape identification, growth was made by all but one student in both the control classroom and the classroom taught outdoors. Five out of six children in each group improved on the final assessment by one or two shapes. Two children, one in the control classroom and one in the outdoor classroom, identified the same number of shapes in both assessments. It is important to note, that while not significant, the students in the outdoor classroom, however did outperform the control classroom in academic growth from pretest to post-test score. Students from the outdoor class gained, on average, one point higher on the post-test when compared to the students in the control class, which on average, gained only 0.8 point. There was not significant difference between the two groups and in reality, neither group performed to the expectation of mastery. Several variables may have impacted or contributed to

this outcome. This study was done at the beginning of the school year. Many of the students came from a background where they did not attend preschool, and this was their first few formal months in school. Students were still learning how to be students during this time. Another possible reason to the data being skewed in the category of mathematics is the fact that this math standard is not taught until later in the school year. Students simply may not have had the foundational skills and background knowledge to comprehend the lessons being taught, whether they were being taught inside or outside.

Action Plan

The purpose of this four-week study was to determine if there is a correlation between students' academic performance in reading, math, and science and the location of their instruction - indoors versus outdoors. By collecting data from students in public kindergarten, second-grade, third-grade, and gifted third-grade classes, this study aimed to determine the difference of academic achievement after utilizing outdoor education to teach standards-based core curriculum. The study aimed to find out whether or not outdoor learning during core subject curriculum positively impacts students academic success and on task behavior.

Based on the findings of two regular education second and third grade classrooms, the following conclusions were drawn. There is an increase in students' on-task behavior when engaging in independent reading outside compared to inside. As a whole, 75% of students maintained or increased their on-task behavior outdoors as opposed to indoors. On average, students were on task 62% of the time indoors and 69% of the time outdoors.

There is an increase of students' average words per minute fluency while reading outside compared to inside. On average, students scored 8.7 words per minute more when outside as

compared to inside. Eleven out of twelve, or 91.7% of students, performed better outdoors compared to indoors. There is a greater improvement in students' reading levels after being taught reading curriculum outside for four weeks compared to students who learned the same curriculum inside.

Based on the findings of a gifted third-grade classroom, the following conclusions were drawn. There was neither an increase nor a decrease in students' on-task behavior when engaging in independent reading outside compared to inside. As a whole, 50% of students increased their on-task behavior outdoors as opposed to indoors. On average, students were on task 91% of the time indoors and 90% of the time outdoors.

When comparing to the mainstream classrooms included in this study, there was not an increase in students' average words per minute fluency while reading outside. Instead, the growth came from reading indoors. On average, students scored 10.7 words per minute less when outside as compared to inside. Six out of six, or 100% of the students, performed better indoors versus outdoors.

There is a greater improvement in students' reading levels after being taught reading curriculum outside for four weeks compared to students who learned the same curriculum inside. On average, students who received reading instruction outdoors, went up in two more reading levels than the students in the control class.

Based on the findings of a mainstream kindergarten classroom, the following conclusions were drawn. There is not a significant improvement in student's ability to identify shapes after being taught math curriculum outside for four weeks compared to students who learned the same curriculum inside. On average, students increased their test scores by 1.0 point compared to the

control class average increase of 0.8 point. There is a significant improvement in student's ability to identify and describe characteristics of living and nonliving organisms after being taught standards-based science curriculum outside for four weeks compared to students who were taught inside. Five out of six, or 83%, students, who experienced learning outdoors, were able to increase their sorting proficiency of living and nonliving organisms compared to 0% of the students in the control class to experience growth in sorting proficiency.

Based on the findings of the two regular education second and third grade classrooms, the following action steps are recommended. The data from this research showed an increase in on-task behavior during independent reading time when the students were outdoors. Educators should consider taking their students outside for independent reading time. The students in the classrooms participating in this research read on average more words per minute outside than inside. In addition, , educators should consider spending more time outside than inside during reading instruction as the data from this study showed an increase in reading levels after teaching curriculum outdoors.

Based on the findings of a gifted third-grade classroom, the following action steps are recommended. In this research, students' word per minute fluency was better indoors versus outdoors, as a result, it is recommended that reading fluency assessments should be done indoors for gifted students. In addition, for this study, the data showed a greater increase in reading levels after teaching curriculum outdoors as opposed to the control class who only read indoors. Educators should consider spending more time outside during reading instruction.

Based on the findings of a kindergarten classroom, the following action steps are recommended. The data from this research showed an increase in subject mastery in

kindergarten science standards in students who learned outdoors compared to students who learned indoors. Educators should consider teaching core concepts or making connections to the outdoors. The data from this study showed there was not a significant increase in subject mastery in kindergarten mathematics, therefore, further research should be done on this topic at a later time in the school year.

The overall results of this research show a positive influence of outdoor learning on mastery of core curricula in some classrooms while not in others. Because some correlation was shown from a short, four-week study, it is recommended that a longer study is completed potentially with more students. It is also recommended for a similar study to be performed at the end of the year to see if results differ. The recommendation to perform the study at the end of the year rather than in the middle of the school year would be to keep the variable of similar weather conditions as in the fall. This recommendation would also allow researchers to see how students perform after classroom culture and relationships were well established. The previous research done in the area of academic and behavioral impacts of outdoor learning, as evidenced in the literature review, show an increase in academic achievement and behavior in school, there is reason to believe these suggested studies would provide similar results.

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Appendix A

Anecdotal Engagement Inventory

Outside: _____

	3	6	9	12	15	18	21	24	27	30	
Student 1											
Student 2											
Student 3											
Student 4											
Student 5											
Student 6											

Key:

Check Mark: on task	T: talking to others	Pic: looking through pictures	W: walking or moving around the area
E: eyes wandering	P: playing	R: resting	C: changing books

Inside: _____

	3	6	9	12	15	18	21	24	27	30	
Student 1											
Student 2											
Student 3											
Student 4											
Student 5											
Student 6											

Key:

Check Mark: on task	T: talking to others	Pic: looking through pictures	W: walking or moving around the area
E: eyes wandering	P: playing	R: resting	C: changing books

Appendix B
Fountas and Pinnell Record

Fountas and Pinnell Level

	September	October
Student 1		
Student 2		
Student 3		
Student 4		
Student 5		
Student 6		

Fountas and Pinnell Comprehension (%)

	September	October
Student 1		
Student 2		
Student 3		
Student 4		
Student 5		
Student 6		

Fountas and Pinnell Fluency

	September	October
Student 1		
Student 2		
Student 3		
Student 4		
Student 5		
Student 6		

Appendix C
Second and Third Grade Fluency Passages
Received from the Prior Lake-Savage Area Schools

ORF Progress Monitoring 1

Riding the Bus to School

I ride a big yellow bus to school. I stand on the corner of our 15
street with my friends and we wait for the bus. My friend's 27
grandma waits with us. When it's raining, she holds an umbrella 38
to keep us dry. Sometimes when it's cold she brings us hot 50
chocolate. 51

I leave my house to walk to the bus stop after my parents go 65
to work. I watch the clock so I know when to leave. Sometimes 78
mom phones me from her office to remind me. Sometimes she 89
can't call, so I have to be sure to watch the time. 101

Our bus driver puts his flashing yellow lights on and then 112
stops right next to us. When he has stopped he turns the red 125
lights on so all the cars will stop. He makes sure we are all 139
sitting down before he starts to go. He watches out for us very 152
carefully. 153

My friends and I are the first ones to be picked up by the bus. 168
We like to sit right behind the bus driver and watch while he 181
picks up all the other kids. We know where everyone lives. By 193
the time we get to our school, the bus is almost full. Sometimes 206
the kids get noisy and the driver has to remind us to keep it 220
down. He says their noise makes it hard for him to concentrate 232
and drive safely. I am glad that our bus driver is so careful. 245

Total words: _____ – errors: _____ = words correct: _____

Retell: ORF Total: _____

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48		
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71		
72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94		

Retell Total: _____

DORF Progress Monitoring 1

A Present from Me

I wanted to take my stepmother out to dinner for her birthday 12
and pay for our dinner with my own money. I wanted it to be a 27
surprise and I wanted it to be just from me. The problem was, I 41
didn't have any money! 45

I went out to try to find ways to earn money. The lady who 59
lives in the apartment upstairs said she wanted to get rid of all 72
her empty soda cans and bottles. She said I could keep the 84
money for the deposit if I took all of the cans and bottles back to 99
the store. It took me five trips, but I got them all taken back to 114
the store. 116

The man in the apartment downstairs said I could walk his 127
dog after supper every night for two weeks. Our neighbor lady 138
said she could use some help putting out the trash and getting rid 151
of old newspapers. One lady in our building said she would like 163
some help with her groceries, but she couldn't afford to pay me. 175
I helped her anyway. She said she would give me some flowers 187
to give to my stepmother. 192

The day before her birthday I asked Mom if she would go on 205
a date with me for dinner. She was surprised when I paid for the 219
dinner with the money I had earned. She made me tell her where 232
I had gotten the money. Then she gave me a big hug and said it 247
was the best birthday present ever. I think she liked the flowers 259
the best of all. 263

Retell: Total:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48			
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71			
72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94			

Appendix D
Fluency Passage Record

Fluency Passage
Words per minutes

	Week 1 9/18-9/22		Week 2 9/25-9/29		Week 3 10/2-10/6		Week 4 10/9-10/13	
	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside
Student 1								
Student 2								
Student 3								
Student 4								
Student 5								
Student 6								

Appendix E

Observational Checklist

Observational Checklist for Sorting Objects

This assessment will be given at the beginning of the action research and the end. Student growth will be measured by those in the class participating in outdoor education and by the class that is not. Students will be asked to sort objects in different ways. This assessment connects to math standard K.3.1.2 and science standards K.2.1.1.1 & K.1.2.1.1. Between 12-15 objects will be given for students to sort and assessment will be given to six students from each class (Three boys and Three girls).

Student Targets	**Assessment 1** (beginning of AR) 1 Point given for each demonstration of competency	**Assessment 2** (end of AR) 1 Point given for each demonstration of competency
Student is able to sort objects into two groups: those that are living and nonliving. For example: Cars, pencils, trees, rocks.		
Student can give explanation as to why objects were sorted in this way.		
Student is able to sort objects in terms of color, size, shape, thickness, and texture.		
Student is able to communicate reasoning for the sorting system.		
Student is able to explain the properties of living and nonliving organism.		
Total Points:	_____ out of **6**	_____ out of **6**

Appendix F

Student Sorting Interview

Student Interview/Explanation for Sorting Questions

How did you sort your objects?

Can you tell me why you decided to sort them in this way?

	Teacher Notes to Student Responses
Student 1 (female)	
Student 2 (female)	
Student 3 (female)	
Student 4 (male)	
Student 5 (male)	
Student 6 (male)	

Appendix G

Shape Recognition Data Assessment

Shape Recognition Data Assessment

Assessment will be given to two classes (one participating in outdoor education and one that is not). The assessment will be given at the beginning of the action research and again the end. The data from student growth will be analyzed. (Linked to math standard K.3.1.1)

Students are able to recognize/name the shape	**Yes**	**No**
Square		
Circle		
Triangle		
Rectangle		
Trapezoid		
Hexagon		
Cube		
Cone		
Cylinder		
Sphere		