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The Affects of Nature Based Learning on Children’s Eco-centric Attitudes

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_________________________________________                                    ___________________
Advisor                                                                                                          Date
Abstract

The purpose of this action research study was to discover if exposure to nature-based education would increase student’s eco-centric views of the environment. The intervention took place over a four week period at a private Montessori school in France. 11 students and their parents participated in the study. Students ranged in age from 2 to 3 years. Qualitative and quantitative data were both collected via a parent questionnaire, pre and post student surveys, daily observations, and a teacher reflection journal. Analysis of the data revealed that the more days a child participated in the nature-based lessons and activities, the more eco-centric development they achieved. Further research could be done during different seasons throughout the year as outdoor time was limited during the winter months. A similar study conducted over a longer period of time may also yield interesting results.

*Keywords: Montessori, nature, eco-centrism, attitudes, toddlers*
Through observation of both indoor and outdoor Montessori environments as well as conversations with other Montessorians, it is apparent that preschool aged students lack respect for nature. The children seem unfazed and disinterested by natural wonders like the weather, changing of the seasons, plants, and animals. A study of 1,000 parents revealed, “Around 80 percent of parents admitted they have never taken their children star gazing or fishing… 37 percent had never taken their family looking for wildlife.” (Carter, 2014). Toddlers, from fifteen months to three years of age, are natural scientists exploring the world through their senses. They are intrinsically drawn to nature but need guidance and modeling to learn how to respectfully admire it. Growing up in an urban environment does not provide these children with many opportunities to experience nature first hand. With family schedules taking up more and more time, children have less time to experience the outdoors.

“Nature deficit” is a real problem affecting the children of today. Research showed trends over the past few decades regarding children’s exposure to nature and time spent playing outdoors. Children today are not experiencing nature which is causing problems like obesity, ADHD, and ambivalence toward the environment. Many studies showed that early childhood experiences with nature, and the outdoors significantly increased the probability of developing an eco-centric (an internal desire to take care of the environment) mindset. (Dowdell, Gray, & Malone, 2011; Tucker, 2006; Russel, 1999; Rivkin, 1997; Keman & Divine, 2010).

The location of this study takes place at a Montessori school situated in a historic and medieval village in France. Both indoor and outdoor environments are utilized for the implementations which occur throughout the course of this study. The indoor environment is the toddler Montessori classroom. The outdoor environment features a thirty yard gated space and a fifty-yard non-gated space. The gated space hosts both natural and manmade elements while the
non-gated space has only natural elements. The primary participants are the students of my
toddler class who range in age from two to three years. The parents of the students also
participate to a smaller degree.

The data tools developed were designed to assess the children’s exposure to nature, eco-
centric attitude, and respect for the environment from the beginning of the study through the end.
Four data tools were used throughout the study to document and track eco-centric attitudes.
These data tools consisted of a parent questionnaire, a pre and post student survey, teacher
observation notes, and teacher self-reflection journal. Formal sessions took place during the
morning work cycle and during outdoor playtime. Informal sessions took place spontaneously
throughout other times of the school day.

This study was designed to provide children with exposure to nature on a daily basis.
Man-made materials were replaced with natural materials, special crafts were introduced with all
natural products, and specific outdoor elements were utilized daily. Strategies were used to
incorporate nature into various aspects of the classroom such as, exposing the students to a
variety of natural objects both living and nonliving, focusing language units on natural
existences, inviting the students to become active participants in caring for the nature around
them, employing songs and stories about nature, and more. One example was collecting nature
on a walk and then categorizing, counting, sorting, and examining the items in the classroom.
The intended outcome of this research was for children to gain a sense of eco-centrism and
develop a love and respect for the natural world.
Review of Literature

This literature review will explore the benefits of developing eco-centric attitudes in young children comprised in four sections. The paper will begin by defining eco-centrism in contrast with anthropocentrism. The first section explores the many benefits of developing an eco-centric attitude beginning with physical and psychological wellbeing and concluding with developing environmental awareness and a lifelong love of nature. The second section discusses eco-centric attitudes of children by examining what current attitudes are and how to develop positive attitudes in children. The third section focuses on the difficulties teachers face when it comes to developing eco-centric attitudes. These difficulties are examined in order of technology, urban settings, and safety. The fourth section investigates strategies effective teachers use to promote nature based education. The strategies discussed include outdoor play and sustainability education. The literature review closes with a conclusion of the summation of the literature.

**Eco-Centrism Explained**

Scientists categorize the two views one can take in regards to the environment as *anthropocentric* and *eco-centric*. Anthropocentrism is a belief that humans are the most important part of the earth and nature is present only to serve human needs. (Cocks & Simpson, 2015, p.216-217). Therefore, anthropocentrics believe that environmental preservation should only be done if it satisfies the needs of humans. Eco-centrism is an internal belief that states human beings are not the center of the universe but rather a part of the balance of nature (Cocks & Simpson, 2015, p.216-217). Also, the environment is intrinsically valuable and should be preserved purely to benefit the environment. This literature review will address the eco-centric view and how to develop it within children.
Benefits of an Eco-centric Attitude in Children

Physical and Psychological Wellbeing

The benefits of being in nature are plentiful for young children (Dowdell, Gray, & Malone, 2011; Hachey & Butler, 2009; Nedovic & Morrisey, 2013; Rivkin, 1997; Torquati, 2010). In their study on two contrasting early childhood centers, Dowdell, Gray, and Malone (2011) identified that children who spent more time outdoors during the day in nature-based environments developed longer attention spans, engaged in imaginative play more frequently, and interacted socially with peers. The study also showed that children who spent a limited amount of time outside in fixed environments were more prone to engage in a risky or dangerous behavior (Dowdell, Gray, & Malone, 2010). A study conducted by Hachey and Butler (2009) revealed that nature-based play in preschool classrooms helped children develop scientific inquiry skills. This study focused specifically on gardening and plant care and the positive effects the children experienced (Hachey & Butler, 2009). Research conducted by Nedovic and Morrisey, (2013) found that children who spent time in natural settings had higher concentration levels and attention spans than children who spent more time indoors. Likewise, Rivkin (1997) identifies that the physical, cognitive, and emotional development of children are all affected by their experiences and time spent in natural settings. Rivkin’s (1997) studies found that children tend to have more positive social relationships when they spend more time in nature. Overall, spending time in nature directly relates to a child’s physical and psychological wellbeing.

Not only is a child’s psychological development dependent on spending time in nature, their physical development is dependent as well. A study conducted on children aged three to sixteen found that those living in "greener" environments were more likely to have a lower Body Mass Index (BMI) than those in more rural environments (Torquati, 2010, p. 99). Similarly,
studies have shown that preschool children who spend time in the outdoors daily are less likely to experience symptoms associated with attention deficit/hyperactivity disorder (ADHD) (Torquati, 2010, p. 99, Tucker, 2006, p. 13). Spending time outdoors can lead to both physical and psychological benefits.

**Environmental Awareness and Lifelong Love**

The time a person spends in nature as a child directly correlates to their environmental awareness as an adult (Ärlemalm–Hagsér, 2013; Ewert, Place, & Sibthorp, 2005; Russel, 1999; Rivkin, 1997). Through a study done in Swedish preschools, Ärlemalm–Hagsér (2013), found that pro-environmental behavior as an adult is fostered throughout childhood. Swedish preschools have a long standing reputation for being rooted in nature and focusing on environmental issues (Ärlemalm–Hagsér, 2013, p. 27). This notion of “education for sustainability” is what researchers believe contributes to Sweden’s pro-environmental attitude (Ärlemalm–Hagsér, 2013, p. 25-28). Swedish educators recognize children as whole, competent beings and allow them to develop skills of "active and responsible citizenship." (Ärlemalm–Hagsér, 2013, p. 31). Russel (1999), through her research with whale-watching, suggests that nature-based experiences are what cultivate environmentally aware citizens who care about the environment and seek to protect it. Moreover, research points to a correlation between what individuals spend their childhood doing and what they become passionate about as adults (Ewert, Place, & Sibthorp, 2005). While there appear to be other variables which contribute to an individual’s environmental awareness, childhood experiences seem to be the most prominent link. Ewert, Place, and Sibthorp (2005) used the "Dominant Social Paradigm (DSP) and the New Environmental Paradigm (NEP) to show people’s perceptions of the environment were shaped
by their childhood experiences. If children do not experience nature or spend time outdoors then they will most likely grow up with little to no appreciation for the natural world.

On the other hand, Rivkin (1997) suggests that children who do not spend time in natural environments do not learn about the plants and animals who abide there and thus, do not grow up to care about them. Rivkin (1997) states that there has been a rapid departure from nature for children in the 21st century. Children spending limited amounts of time outdoors is likened to a change of habitat that either requires an immediate solution or re-adaptation (Rivkin, 1997, p. 61). Outdoor play is “endangered” and will severely affect the environmental attitudes of the upcoming generations if not fixed (Rivkin, 1997).

**Eco-centric Attitudes and Respect for Nature**

**Current Attitudes**

Current attitudes surrounding eco-centrism and nature differ based on location, socio-economic status, political views, gender, and age range (Ewert, Place, & Sibthorp, 2005, p. 225). Research has pointed to outdoor experiences during early childhood to play a key role in environmental attitudes (Ewert, et all, 2005, p. 226). Other factors influencing people’s attitudes toward nature stem from their parent and peers beliefs (Ewert, et all, 2005, p. 226). Ewert et all, (2005) found through their study that “place attachment” plays a significant role in environmental attitudes. (p. 235). This theory states that people become attached to certain natural environments due to an emotional or spiritual connection developed during childhood (Ewert, et all, 2005, 2005, p. 235). Familial values and social influences played an important role in an individual’s development of eco-centric attitudes (Ewert, et all, 2005, p. 234-235). Therefore, psychological connections developed in childhood also affect a person’s eco-centric or anthropocentric viewpoint.
Technology has become a main distraction from spending time outdoors. Bonnet and Williams’ (1998) research in the United Kingdom has revealed that many environmental education endeavors have been removed from early education curriculum. This has left the few remaining environmental experiences for children in science and geography units (Bonnet & Williams, 1998, p. 159). There seems to be a correlation regarding children's eco-centric views and what is portrayed about the environment from the media. Modern children spend a higher average of time indoors using or viewing multi-media electronic devices than their ancestors (Bonnet & William, 1998, p. 159). Therefore, instead of development stemming from the natural world, it stems from the media. The majority of children's television shows or electronic games are not focused on nature nor do they portray environmentalist viewpoints (Bonnet & William, 1998, p. 160). Ultimately, young children are not going outside to experience nature, nor experiencing it from the indoors, which is leading to children having little exposure to the environment. Insignificant exposure to the environment does not allow children to develop respect, love, or positive attitudes towards nature.

**Cultivating Positive Attitudes and Respect**

Researchers and educators alike believe that the key to cultivating positive attitudes around nature and developing respect for the environment begin in early childhood (Ärlemalm–Hagsér, 2013; Hachey & Butler, 2009; Williams, 2008). Experiences during childhood form part of the beliefs and attitudes children develop about the world around them. A Swedish researcher, Ärlemalm–Hagsér (2013), has suggested that there is a window of potential during childhood where children can develop positives attitudes about nature only if they are exposed to it. The Swedish model also suggests that children need role models in their childhood who show respect for nature as well (Ärlemalm–Hagsér, 2013, p. 28). Action researchers, Hachey and Butler,
(2009) state that gardening in childhood can help promote a child’s eco-centric view. Williams (2008), who is the site director for the Smithsonian Early Enrichment Center, states that exposure to nature should begin in infancy. Therefore, the development of eco-centric beliefs begins in infancy. Her research has found that many young children can develop adverse reactions to nature or even phobias if they are not exposed to the outdoors from a young age (Williams, 2008). Since children’s schedules and activities are often dictated by their family’s plans, it is important for parents to make time for their child to spend outdoors (Williams, 2008). Overall, positive attitudes and respect towards nature are ideals that are cultivated from birth and throughout childhood.

**Difficulties Teachers Face when it comes to Developing Eco-Centric Attitudes**

**Technology, Urban Settings, and Safety**

There has been a decline in children’s exposure to nature over the past several decades as children do not receive enough exposure to nature and the natural world (Dowdell, Gray, & Malone, 2011; Kernan & Divine, 2010; Rivkin, 1997; Tucker, 2006). A main reason children are not being exposed to the environment is due to television and other electronic devices (Nedovic & Morrisey, 2013, p.281; Rivkin, 1997, p. 62). Technology is even present in the classroom encouraging many children to select indoor recess instead of outdoor play time.

Urban environments are an unavoidable part of our society. While urbanization has allowed cities and economies to flourish, they have taken the place of natural habitats and ecosystems. Nedovic and Morrisey, (2013) suggest that over the past twenty years children growing up in urban environments have experienced a severe lack of exposure to the outdoors. Similarly, Williams (2008) work with urban families in Washington D.C. has pointed to the severe lack of environmental exposure children growing up in the city face. Rivkin (1997) notes
that children have lost their “natural habitat” due to urbanization and industrialization. New housing and developments take the place of natural environments.

Safety is a main concern for modern day parents who fear for the wellbeing of the children during outdoor play. According to Nedovic and Morrisey (2013), lack of exposure to the outdoors stems from an increase in parents wanting to avoid risk and danger for their children. An Irish study, by Kernan and Divine (2005), found that parents and caregivers were fearful of allowing children time outdoors due to the child’s vulnerable nature (p. 372). Automobiles also cause safety concerns for children as their fumes create chemicals in their air which may cause children to develop lung cancer (Rivkin, 1997, p.62). In addition, automobile fumes deplete good layers of the ozone which allows more ultraviolet rays to reach earth (Rivkin, 1997, p.62). This makes parents concerned about applying sunscreen or keeping their children indoors during the hottest parts of the day. At childcare centers, parents worry about traffic and strangers (Williams, 2008, p. 22). There is not significant research to determine why these fears have crept into modern society yet were not a part of earlier generations.

**Strategies Effective Teachers use to Promote Nature Based Education**

Researchers agree that there are many obstacles both educators and administrators need to overcome to support young children's need to be with nature. Parent support, ethnic beliefs, and climate, affect how educators can implement a nature-based curriculum (Williams, 2008, p.22). Educating parents is an important aspect of integrating nature-based education.

**Importance of outdoor play**

Many researchers identify that pre-school and early school settings can be the key to connecting children with nature and may be the last hope (Dowdell, Gray, and Malone, 2011; Ewert, Place, & Sibthorp, 2005; Kernan & Divine, 2010; Nedovic & Morrisey, 2013; Rivkin
During the week, children spend a majority of their waking hours at school. One of a child’s main role models during this time is his teacher. Therefore, teachers can be the link which connects children to nature. Teachers can plan in advance, so there is sufficient time in the schedule to allow for outdoor play (Williams, 2005, p.23). Teachers need to educate parents on the importance of outdoor play and take steps to help ensure the children’s safety while outdoors. Williams (2005) suggests having weather policies in place as well as storing extra outerwear if needed (p. 23). It is also important that teachers maintain positive attitudes about the outdoors as well even during inclement weather and interactions with insects or rodents (Williams, 2008, p. 22). Taking toddlers on neighborhood walks is a developmentally appropriate and safe way for them to experience the outdoors daily (Williams, 2008, p. 23). Overall, it is the duty of the administration, educators, and parents, to ensure children can experience outdoor play on a daily basis.

**Sustainability**

Sustainability education is one way for teachers to effectively implement nature-based education into their classrooms. According to Swedish researchers, effective teachers can integrate sustainability education into their indoor and outdoor curriculum to allow children to develop eco-centric values (Ärlemalm–Hagsér, 2013). Experiences with nature during early childhood have been directly correlated with a person’s pro-environmental beliefs as an adult (Ärlemalm–Hagsér, 2013, p. 27). Sustainability education focuses on care of the environment through education with “play, learning, and development” operating together (Ärlemalm–Hagsér, 2013, p. 28). The educational principles are built on care and education with play, learning, and development operating hand in hand. Environmental sustainability can be taught in the early childhood classroom through indoor and outdoor instruction. Sustainability education
partnered with social justice education in early childhood has been shown to increase children’s respect, love, and preservation of the environment (Ärlemalm–Hagsér, 2013, p. 27-28).

**Conclusion**

Children growing up in the 21st century are being less exposed to the natural world than any other generation in history. Developing eco-centric attitudes in young children is a key way to help preserve the earth’s environment for the future. There are many benefits for children who spend significant time using natural materials and playing outdoors. Nature-based education can be implemented at school to help expose young children to the natural world and allow them to develop a lifelong respect towards nature.

**Description of Research Methodology**

The methods created for this study were formulated and executed with the research question in mind, “What effects will nature-based learning have on student’s eco-centric view?” This question led me to develop four unique data tools. Research of literature led me to an understanding that “nature deficit” begins in the home. Therefore, the first data tool I implemented was a parent questionnaire (Appendix A) in order to get baseline data for the child’s level of exposure to nature. Next, I conducted a pre-survey (Appendix B) with each child and compared their responses to their parents’ responses on the questionnaire. I also used this (Appendix C) information to plan lessons and activities. Throughout the study, I kept a daily observation record and a daily self-reflection journal (Appendix D). At the end of the four weeks, I conducted a post-survey with each child. An explanation of the data tools and their execution follows in further detail below.
Parent Questionnaire

The parent questionnaire was developed to assess the student’s exposure to nature and eco-centric attitude, and the family’s beliefs and attitudes regarding nature. Hendricks (2013) suggests that written surveys often supply more honest answers from participants as there is more anonymity than in a face-to-face interview (p.114). The parent questionnaire helped me get a better idea of the practices held by the family unit as well as the student. The questionnaire was made up of fifteen statements which the parents rated based on the Likert Scale. Likert or frequency scales use, “fixed choice response formats and are designed to measure attitudes or opinions” (McLeod, 2008). For example, the statement, “My family enjoys spending time outdoors” would be followed by a selection of five numerical representations. The parent would then circle a number between one and five; one being strongly disagree, two being disagree, three being neither agree or disagree, four being agree, and five being strongly agree. This tool served as a baseline for the children’s exposure to natural elements before coming into the classroom and allowed me to better develop implementations that would strengthen their eco-centric attitude (Appendix A).

Pre-Survey and Post survey

The goal of the surveys was to measure the student’s thoughts, perceptions, and attitudes regarding nature before and after the study. Hendricks (2013) explains, “Baseline data are collected before the implementation of an intervention, and they are used to make comparisons of participants before and after intervention occurs” (p.119). The surveys were delivered as an oral assessment as my students are two and three years of age and thus, not old enough to read. In addition to the parent questionnaire, this tool allowed me to reevaluate and modify planned
interventions. In comparison with the pre assessment, the post-assessment aided me in collecting data on whether or not the student’s eco-centric attitude had evolved or not (Appendix B).

**Daily observation record**

Hendricks (2013) suggests, “Observational data can be the most important source of information in an action research study” (p.100). Observational records were completed daily in narrative style. The records documented behaviors and interactions with nature (positive and negative) and student’s choice of materials (natural or produced) during a selected period of time (work cycle and outdoor time).

During our morning work cycle, I observed and documented on the observation record how the children interacted with the specific lessons and activities I created based on the parent questionnaire and student pre-survey. In Montessori, *lessons* or *works* refer to specific materials, either traditional Montessori materials or teacher-developed materials, which are displayed in either a tray or basket and available to the children to develop skills in a certain area. For example, I replaced all of the manufactured materials on the Practical Life shelf with natural materials (Appendix E). For our daily food preparation, I supplied local products and foreign products with lessons on where they came from and how they were grown or made. The Language shelf was transformed into a nature unit with objects, pictures, matching works, and more, all centered on nature (Appendices F, G, H). I brought in a plant care table and set it up with pots, vases, a watering can, a mister, scissors, and cloths (Appendix I). Each week, a family brought in either a potted plant or bouquet of flowers. The children were then able to plant the plant into a pot or prepare the flowers and display in vases. Outside, the children had free range to explore our two outdoor play areas. I documented which activities the children selected to play with, whether produced or natural), how they manipulated natural materials, and other
observations of their attitudes and behaviors outdoors. Other activities which were made available to the children were caring for the fish, composting, animal caring with dogs, planting seeds, making bird feeders (Appendix J), a discovery tray (Appendix K), washing cloths with vegetable soap (Appendix L), grinding coffee beans, and more (Appendix C).

**Daily reflection journal**

The daily reflection journal was an important aspect to the progress of the study. Hendriks (2013) explains, “Writing in a journal throughout an action research study is a good way to record observations, ideas, challenges, successes, and failures and it provides a way to keep track of the reflective and reflexive inquiry processes an educator engages in as values, assumptions, goals, and actions are continuously examined” (p.36). I used this tool to note my own perceptions and observations about the advancement of the study. The questions allowed me to identify if the implementations were successful each day and then reflect on why or why not. One of the most important questions which I analyzed daily was whether or not the opportunities worked for all children. Due to the mixed-age range of the Montessori classroom and the freedom children have in selecting their work, certain implementations were better suited for different students. However, some implementations were not appealing to some students. Therefore, considering what materials did not work for all children was what led me to modify materials and create new ones. Overall, this tool helped me to be proactive in my methods and keep the research ever evolving (Appendix D).

**Analysis of Data**

At the conclusion of my research, I analyzed the data to find trends and results. Out of my 15 students, 11 parents gave me permission to use their child’s data for the study.

**Data Collection Tool: Parent Questionnaire**
Being new to the area, I did not have any previous knowledge on the home life of rural and suburban French families. Therefore, before I began the four weeks of implementations, I collected baseline data from the parents and children. My goal was to evaluate the level of exposure to nature the children had experienced in their home lives in addition to their current attitudes and behaviors about the environment.

Statements one through seven, ten and twelve on the parent questionnaire directly relate to the behaviors of the family. Statement number one, shown in figure 1, revealed that the majority of the families consider spending time outside to be something which they enjoy. Only one family selected being *indifferent* to whether or not they like to spend time outdoors.

![Figure 1. Questions 1-3 from Parent Questionnaire](image)

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Indifferent</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My family likes to spend time outside</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2. My family spends less than 10 hours a week outside</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>3. My family spends more than 10 hours a week outside</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>
In the answer to questions two and three, I was surprised to discover that half the families reported spending more than ten hours a week outside. The responses to these two statements, shown in figures 2 and 3, were very mixed. In question two, 41% strongly agreed to spending less than ten hours a week outside which means that the majority of families spend between one and ten hours a week outside. In question three, 17% said they strongly agreed in spending more than ten hours a week outside. The differed responses most likely relate to where the family lives. The school is situated about an hour outside of Paris. Therefore, some families live closer to the city in more urban areas while others live farther out in suburban and rural areas. The responses to these statements may also vary depending on the time of the year.

**Figure 2. Questions 4–7 from Parent Questionnaire**

<table>
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<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Indifferent</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. My family enjoys gardening</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. My family enjoys hiking</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6. My family enjoys going to the park</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7. My family enjoys camping</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Questions four and five specify what types of activities the family prefers to engage in outside. The responses were more varied in this section. The responses to these two questions illustrated the depth of the family’s involvement in natural activities. For example, if the parent selected that the family enjoys gardening than there is a higher probability that the child has been exposed to these natural activities. I selected activities that are available in the area or within an hour radius.

The vast majority selected the response designating a high interest in going to the park which is a much more broad experience than gardening or hiking. In addition, there are public parks in every city, town, and village in France making them easily accessible to families living in urban areas.

Camping received a mixed response as it is a specific type of leisure activity. There is a campground about three miles away from the school so it is more accessible to families who live in the immediate area. If the family lives closer to Paris, however, there are no campgrounds.
Questions eight, nine, and eleven related directly to the attitude and behaviors of the child. Question 8 shows that 86% of families agreed that their child prefers to be outside. 14% believe their child to be indifferent to preferring the outdoors over being indoors. I found it interesting that all the families believe to some degree that their child is respectful towards nature. Regardless of their experiences, they feel that their child respects nature. This tells me that from the parent’s point of view there is value placed on respecting nature. Statements ten and twelve relate to the beliefs held by the family unit. Overwhelmingly, parents responded that the environment is highly important to their family.
Figure 4. Questions 13-15 from Parent Questionnaire

Statements thirteen, fourteen, and fifteen, directly relate the parents’ beliefs and eco-centric view. Figure 4 shows the statements that reveal the parents eco-centric and anthropocentric attitudes. While 9%, which represents one family, were indifferent. The rest disagreed with having an anthropocentric attitude. 100% of parents agreed that having an eco-centric attitude is important. These questions are important because the research is focused on developing an eco-centric attitude in the students. Every parent selected that they strongly agree with wanting their child to grow up caring for the environment as shown in figure 4.
Data Collection Tool: Pre- and Post- Student Surveys

My goal was to evaluate how an eco-centric attitude might develop with the introduction of nature-based learning materials and specific lessons on the environment. Question two asked the students what they like to do outside. In the pre-survey, some of the responses were centered around non-natural materials questions seven and eight ask the child how they can help protect nature and how they can be kind to nature. These two questions had the greatest change from the pre-survey to the post-survey. In the pre-survey, many of the responses were, “I don’t know” or a blank stare. The responses from these questions on the post-survey truly showed the growth and development of eco-centricity over the four weeks. Some of the responses were, “we can wash our clothes with vegetable soap”, “plant seeds”, “make food for the birds”, “pet nice the dog”, “make pretty flowers”, “compost”, “feed the rabbit”. The children who attended less than six days during the study showed the least development in attitude. Most of those children’s responses remained almost the same except for Student Nine. Student Nine was only present for four days but was in school the day we made the bird feeders. This student’s response changed on the post-survey as he recalled making the bird feeders.

Data Collection Tool: Daily Observation Log

Initially, I was worried about the fact that not all of my students come to school every day. In France, there is only school Monday, Tuesday, Thursday, and Friday. Some come the full four days a week, but others come only one, two, or three days a week. However, this aspect provided an interesting comparison. At the end of the study, I wanted to see if the amount of days present correlated with the students’ eco-centric growth. Figure 16 shows how many days per each week of the study each child was present. I found that the more days the students were present resulted in the higher growth that they achieved.
To show student growth over the four weeks of the study, I assigned a numerical value to each student. I based this number on observations I made of the students' interactions as well as their pre-and post survey results. In figure 17, I have graphed the correlation between days of attendance and student growth.

The values are as follows: 0 - Little to no growth, 1.0 - Minimal growth, 2.0 - Average or expected growth, and 3.0 - Above average growth.
Figure 6. Correlation of days present and level of growth

Using this data tool, I kept a daily record of which works students selected. I wanted to see if the more children interacted with natural elements would increase the more they desired to work with natural over man-made elements. While attendance may have skewed the results for the children who attended less days, it showed a positive result for the children who attended more frequently. For example, student 3 attended 16/16 days of the study. Figure 18 shows how his selection of nature-based work increased each week of the study.
One of the most important observations I made was during the end of week three and throughout week four. I noticed that some of the children were not only caring for the plants and animals in their environment, but they had begun to show an increase in empathy and care for their peers. I noticed the children rushing to each other’s aid if one was hurt. On January 27, I observed Student 6 gently stroking a sad Student 7 the same way she had learned to stroke the leaves on a delicate plant. While these observations were of the children who attended the most amount of days, they began modeling and teaching the children who attended less. On January 30, I observed Student 3 intervene when Student 10 was mishandling the dog and then show the student how to pet the dog correctly. These are only possible outcomes as a result of the study as other factors may have influenced this increase in empathetic behavior as well.

**Data Collection Tool: Daily Reflection Journal**

Every day during nap time, which fell after the morning and outdoor work times, I took notes on the reflection journal collection tool. There were five questions or statements to reflect
upon. During nap time I would read through the observation notes I had taken and reflect on the questions. The question that brought about the most amount of change was, “Did the opportunities seem to work for all students?” These opportunities encompass all of the nature-based materials inside the classroom and the natural elements found in the outdoor environment. This is something Montessorians reflect on regularly to ensure they are achieving a balance within the multi-age classroom. Reflection is what led me to create the discovery tray which is a tray with different pieces of nature such as pinecones, rocks, seeds, moss, leaves, etc. along with a magnifying glass for closer inspection. I observed that the younger students were not interested in the nature matching cards available on the language shelf so I decided to get a tray with the actual objects pictured on the cards and display them on a tray with a magnifying glass. This caught the attention of the younger and older children and was a highly successful material.

**Summary of Findings**

Overall, more than half of the children made progress during each week and showed the most growth in their eco-centric attitudes by week four. The more often a student attended school correlated with a higher level of growth. It was evident that all the children had experienced some form of nature at home but the type and degree was completely dependent on the family’s preferences and hobbies. Some students were able to experience new things during the study while others, who were already familiar with certain natural activities, allowed their interests and passions to grow. I achieved the results quite close to what I was hoping for when I began the study.

**Action Plan**

The goal of my research was to increase student’s eco-centric attitudes through nature-based educational practices. The data revealed that the more days a student attended the study,
the more their eco-centric attitude developed. The development of eco-centric attitudes is important because these children are the future care-takers of our environment. In the parent questionnaire data tool, the parents agreed that they want their children to grow up caring for the environment because it is inherently good and deserves to be preserved. This study sought to help the children grow that kind of attitude. The students were exposed to elements of the environment that they had not been exposed to at home. Some of the student’s favorite activities were gardening, making bird feeders, composting, flower arranging, and pet care, as the children’s feedback suggested. Overall, the children developed a deeper affection and admiration for the natural world through their interactions during the study.

Throughout the research, I utilized many local materials found around the region. We used local fruits, vegetables, chicken eggs, cheeses, and plants. The students began asking, “Where did this come from?” I developed lessons on plants and animals to help answer their questions. I made photo cards of the seed, the growing medium (tree, bush, ground, etc), and the fruit or vegetable. This allowed the students to understand the journey our food takes to get to us. One of the activities that had the most significance to the students was composting. With this daily practice, the students could see the full circle of our nutritional substances. Some of our compost went to the rabbit, some to the parrot, and the rest to compost for our gardens. Many of the students enjoyed this practice and saw it as a way they could give back to the earth.

The results of this research have led me to add more natural aspects to my classroom. There is no need to use plastic or man-made materials for things when the earth provides us with a bounty of supplies. I plan on conducting regular gardening activities inside and outside when the weather is appropriate. I will continue to offer a discovery tray with magnifying glass that features natural elements from outside that the children can further inspect and explore during
the work cycle. I will focus on new works and activities in the areas which I observed the children to have the most interest in. In addition, I have plans to add more nature to our afterschool curriculum as well.

My co-teacher and I were pleased with the impact this study had on our students. The children’s interest in natural materials grew and their desire to help protect nature progressed. They began sharing their interests with each other, their teachers, and their families. A student who began the study being quite rough with the school dog ended the study knowing how to properly greet and pet the dog. A child who was only interested in playing with toy trucks outside began to explore and play with natural elements instead. Throughout the study, the students became more comfortable with interacting with nature and more eager to make discoveries.

This study may also have led to the students taking more ownership and responsibility over the care of the classroom. For the first two weeks of the study, I had to invite the students to participate in the nature-based activities and lessons. During weeks three and four and even after the study, I observed students acting as caretakers of their environment autonomously. They selected natural materials over plastic and man-made materials. They engaged in taking care of the plants and animals in our classroom independently and through their own volition.

Nature-based education may also have had an impact on the development of empathy. By the end of week three and throughout week four, I observed an increase in empathetic acts between the students. I observed one child caressing a sad child in the same way I had shown her how to gently stroke a leaf. One child corrected another for improperly petting the dog and then demonstrated how to do it with care. These acts continued to grow throughout the end of the study.
I would like to complete this study again during a different time of the year. This study was conducted through the month of January so the natural resources available to us in France were limited. I would be interested to see if the results changed during spring or summer when there would be more opportunities in the outdoor environments. I also think this study could be conducted at a school where all the children come every day. While having part-time students led to an interesting comparison, I would like to see if the results would be different at a five day, full-time school. In addition, I’d like to complete this study in another country to compare findings. This study could also be conducted with different ages as it would provide different opportunities at other levels of development.
References


Appendix A

Parent Questionnaire

Please answer to the best of your ability.

The Likert Scale will be used in answering questions:

(1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree

<table>
<thead>
<tr>
<th>1.) My family enjoys spending time outdoors.</th>
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<tbody>
<tr>
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<table>
<thead>
<tr>
<th>2.) My family spends less than 10 hours a week outdoors</th>
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<table>
<thead>
<tr>
<th>3.) My family spends more than 10 hours a week outdoors.</th>
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<tr>
<th>4.) My family enjoys gardening.</th>
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<th>5.) My family enjoys hiking.</th>
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<th>6.) My family enjoys going to the park.</th>
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<th>7.) My family enjoys camping.</th>
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<tr>
<td>1</td>
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</table>
8.) My child prefers to be outside.

| 1 | 2 | 3 | 4 | 5 |

9.) My child is respectful towards nature.

| 1 | 2 | 3 | 4 | 5 |

10.) Taking care of the environment is important to our family.

| 1 | 2 | 3 | 4 | 5 |

11.) My child is respectful towards animals.

| 1 | 2 | 3 | 4 | 5 |

12.) Taking care of animals is important to our family.

| 1 | 2 | 3 | 4 | 5 |

13.) I believe that environmental preservation should only be done if it satisfies the needs of humans.

| 1 | 2 | 3 | 4 | 5 |

14.) I believe that the environment is intrinsically valuable and should be preserved purely to benefit the environment.

| 1 | 2 | 3 | 4 | 5 |

15.) I want my child to grow up with an attitude that cares for and respects the environment.

| 1 | 2 | 3 | 4 | 5 |
Appendix B

Pre- and Post-Assessment
(Student oral assessment)

Student #__________

Date______________

1.) Do you like going outside?

2.) What do you like to do outside?

3.) Do you like animals?

4.) What is your favorite animal?

5.) Do you like to plant flowers?

6.) What is your favorite kind of weather? (rain, snow, sun, etc.)

7.) How can you help protect nature?

8.) How can we be kind to nature?
## Appendix C

### Daily Observation Record

<table>
<thead>
<tr>
<th>Student</th>
<th>Lessons/Activities Presented</th>
<th>9:00-11:00 AM Indoor Observations</th>
<th>12:30-1:45 PM Outdoor Observations</th>
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</thead>
<tbody>
<tr>
<td>Student 1</td>
<td></td>
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<td>Student 2</td>
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<td>Student 3</td>
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<td>Student 10</td>
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<td>Student 11</td>
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Appendix D

Self-Reflection Journal

Date________

• What type of opportunities did I provide for the students to experience nature?

• Did the opportunities seem to work for all students? Why or why not?

• Were the implementations successful? Why or why not?

• What can I do to improve?

• Positives points:
Appendix E
Appendix G
Appendix H
Appendix J