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The Effects of Using Nature-Based Space & Materials on the Children’s Concentration Levels in an Early Childhood Montessori Environment

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Abstract

This research study explored the effects of using nature-based space and materials on the children’s concentration levels in an early childhood Montessori environment. Nineteen 3-6-year-olds participated in the study for four weeks. The researcher designed and implemented two interventions, nature-based space and nature-based materials, inside an early childhood Montessori environment. The purpose was to holistically improve the children’s concentration levels by being exposed to a nature-based area and materials. The data collection process relied on four qualitative and quantitative data tools: tally sheets, general observational notes, rate sheets, and measurement notes. The data analyzed in this research study suggests exposing young children to both nature-based space and materials in the learning environment is beneficial to their concentration levels. Lastly, the researcher considers further investigation of the effects of being exposed to nature and technology on the children’s brain by using scientific devices to read and interpret the brain activity.

Keywords: Nature-based space, nature-based materials, holistic, concentration, Attention Restoration Theory (ART), Montessori, early childhood education, online school
It is vital to expose young children to nature, especially during the first years of life. As an early childhood educator, it is essential to design and implement both nature-based space and nature-based materials in the early childhood environment. Past research has shown and proven that nature can support children's healthy development, especially the healthy development of concentration (Louv, 2008). Ackerman (2019) proposed that exposure to natural environments can help focus and concentrate holistically. Similarly, Wells, assistant professor at the New York State College of Human Ecology, discovered that "being close to nature, in general, helps boost a child's attention span" (Louv, 2008, p. 105).

Louv’s (2018) study mentioned, “the future is not about designing curriculum. It’s about awakening to creation.” In other words, as human beings, it is essential to educate each other on the countless benefits nature can provide to the overall health, especially during crucial periods of growth. Furthermore, Louv’s (2008) study mentioned that nature-based spaces and materials inspire the infinite imagination within children and serve as the path of ingenuity and inventiveness that can be seen in different groups of children exploring in a natural environment.

In another study, Bento and Dias (2017) examined the impact of early exposure to technology. The researchers found that being exposed to technology during vital developmental years can increase a sense of disconnect from nature, and the child's overall development can be affected. Gottschalk (2019) explored the number of children using desktops, laptops, or tablet computers at school vs. at home. Gottschalk's (2019) research found 72% of students reported using computer technology vs. 93% at home. Keller's (2015) research study has shown that some of the potential risks children can
face if they lack connection to nature can include: developmental deficits such as attention disorders or inadequate physical and emotional health.

Evaluating the risks that children can face when lacking exposure to natural environments is critical to best support young children's overall development. As early childhood educators, it is our responsibility to introduce young children to nature-based spaces and materials before introducing them to digital devices, especially during the most crucial human growth period. This research project studied the effects of using both nature-based space and materials on the children's concentration levels in an early childhood Montessori environment. The research study examined nineteen 3-6-years-old participants, eleven female, and eight males, in a non-profit Montessori school in an upper Midwest region. Two guides and one assistant supported the early childhood Montessori program; however, the researcher was the only person conducting the research study and the data collection process. The early childhood program served national and international children, particularly refugee children in the US.

This research study aimed to provide both nature-based space and materials inside the children's environment, to holistically support the children's levels of concentration and overall health. Based on Siegler's (2020) study, designing and implementing nature-based materials in the early childhood environment can restore the child's attention, improve performance when conducting tasks, and improve the resistance to and recovery from stressful life events. As an educator and to consciously support the children's development, especially the development of concentration, the researcher aims to expose young children to nature-based spaces and materials in the early childhood environment. In this study, the researcher used the experience gained as an early childhood educator to
develop the idea of exposing young children to nature. It was discovered that the time spent in nature-based spaces in the Midwest's upper region was limited. After acknowledging the need to be more exposed to nature, the researcher included a nature-based space and materials inside the early childhood environment to holistically support the children's concentration levels. Specifically, the research study's root appeared by hearing the young children expressing the need to spend time outdoors. After analyzing this need and working collaboratively with graduate professors, the creation of both nature-based space and materials occurred.

In the Montessori early childhood environment, children are exposed to multiple areas that best support their healthy development. The Montessori areas represent a conscious introduction to the world. The areas include practical life, sensorial, language, math, and art. The practical life area in the Children's House represents a gentle introduction to the children's world. This area is consciously designed based on the children's culture to support the children's orientation and adaptation in the world. The Montessori early childhood environment's practical life area includes nature as a core value of the initial acquisition of knowledge. For instance, this area comprises nature-based activities such as peeling and washing fruits and vegetables, caring for plants, and polishing leaves.

Based on pre-data collection and analysis, children demonstrated most interest in areas involving nature and sensorial exposure such as practical life and sensorial areas in the Montessori early childhood environment. As a Montessori early childhood educator, it is essential to provide children with the best to best support the natural development of physical, mental, and spiritual growth. In past research, authors have expressed the
importance of nature in human life. "Nature – the sublime, the harsh, and the beautiful – offers something the street or gated community or computer game cannot" (Louv, 2008, p. 98). As Louv's (2008) study suggested, nature can help cure Attention Deficit Hyperactivity Disorder (ADHD). For this and many other reasons, the researcher found nature to be the pathway to holistically support the children's development, specifically, the development of concentration.

After extensive research and collaboration with the graduate professors, the researcher found the Attention Restoration Theory (ART) as the most appropriate theory to support this research study's exploration and findings. ART has been demonstrated to have the potential to support children's concentration holistically (Ackerman, 2019). To best answer the research question, what are the effects of using nature-based space and materials on the children's concentration levels in an early childhood environment? The researcher relied on ART to explore and examine the benefits nature provides to the children's concentration levels. ART has also proven that nature can renew attention, especially after exerting mental energy (Ackerman, 2019).

After implementing and introducing both interventions, nature-based space and materials, the children in the early childhood environment freely and independently explored both interventions. The data collection process was initiated by gathering pre-data of the children’s interests and levels of concentration. After collecting baseline data for one week, the continuation of data gathering occurred for three more weeks. In total, the researcher gathered data for four weeks in the 2020 Fall semester.
Theoretical Framework

According to Preschlack's (2020) research, concentration has been described as a precursor to both learning something new and self-control growth. Similarly, Montessori discovered that concentration is the cornerstone of human development and explained that they become delighted (Montessori, 1995). The Montessori approach intentionally and consciously provides areas and materials that support the children's development of concentration, with the intention of consciously and holistically supporting the children's levels of concentration in the early childhood environment, the researcher designed and developed a new nature-based space and materials inside the Children's House. Research has discovered that "multisensory experiences in nature help to build the cognitive constructs necessary for sustained intellectual development and stimulate imagination by supplying the child with free space and materials" (Louv, 2008, p. 87).

Besides, more researchers have demonstrated the positive effects nature provides to the children's learning experience. Specifically, nature has been proven to be a holistic path to support children's concentration levels. For instance, Louv's (2008) research study found that nature-based spaces can decrease ADHD symptoms in the children's daily world, including views of green through a window. Similarly, Ackerman's (2019) research proposed that exposure to nature can also improve concentration and the ability to focus holistically. Additionally, Claffey's (2016) study suggested that nature positively impacts cognitive growth that helps children enhance cognitive functioning and concentration.

Thus, Louv's (2008) research study explored the effect of being exposed to nature in early childhood environments. According to Louv's (2008) findings, nature can
improve the children's overall development, especially during the early years of life. Similarly, Louv's (2008) research explained how all intelligence could be stimulated by nature in countless ways, especially the lately explored intelligence, eighth intelligence, or "nature smart." In particular, the study by Ackerman (2019) explained that, particularly after exerting mental energy, Attention Restoration Theory (ART) could renew attention. Similarly, ART has shown that therapeutic environments can help individuals recover from stress and enhance their quality of life. Based on Ackerman's (2019) study, spending time in natural settings or having some green space around can help foster individuals from the effects of stress on one's wellbeing. Correspondingly, ART explored that being exposed to nature, or looking at it, contributes to overcoming mental fatigue and improving the ability to focus and direct one's attention effectively. As educators, when applying ART, the age group is not relevant. As Louv's (2008) research explained, ART's principle applies to all, disregarding age.

Therefore, the researcher found ART the most appropriate theory to apply to this action research investigating the effects of using nature-based space and materials on the children's concentration levels in an early childhood environment. Similarly, the researcher found ART as the most relevant theory to apply in this research since it also relates to the rapid technological advancement humanity has been facing. Based on research, nature could reverse the effects of being exposed to rapid technological advancement, especially the impact on young children's development. For instance, Ackerman's (2019) study explained that after spending sleepless nights preparing for tests or working for long periods on a project or task, nature could renew focus after exerting mental energy. Similarly, Madore's (2016) research explored the positive effects nature
provides to young children. Specifically, Madore suggested bringing nature into the early childhood environment. The purpose of exposing children to both nature-based space and materials was to foster children's healthy development.

Additionally, ART was the most reliable theory to apply to this research study due to its 20-year investigation of the effects of nature on mood, state of mind, and health. As an early childhood educator, it is essential to expose children to natural environments and materials in the early childhood environment to boost concentration levels holistically. Similarly, research has suggested that "By bolstering children's attention resources, green spaces may enable children to think more clearly and cope more effectively with life stress" (Louv, 2008, p. 105).

To that end, ART and information from other research studies were applied to this graduate project to support answering the research question on the effects of using both nature-based space and materials on the children's concentration levels in an early childhood environment. Throughout human history, it has been rooted that nature can improve the overall life of any individual. For instance, studies conducted at the Human-Environment Research Laboratory at the University of Illinois have found that "green outdoor spaces foster creative play, improve children's access to positive adult interaction – and relieve the symptoms of attention-deficit disorders" (Louv, 2008, p. 106). Thus, this framework provides an examination and exploration of the impact nature-based spaces and materials have on children's development, especially the development of concentration. As Ackerman explained, "one important interaction between individual and environment is the restoration of our attention, our energy, and ourselves by experiencing our viewing nature" (Ackerman, 2019, p. 3).
Review of Literature

A vital aspect of children's healthy development is exposure to natural environments in early childhood education (Natural Learning Initiative, 2012). Both nature-based space and materials in early childhood spaces are essential to support the children's physical, emotional, and intellectual learning. Similarly, Claffey's (2016) research suggested that human beings are naturally attracted to the natural world. This research study mainly relied on Attention Restoration Theory (ART) and explained some of ART's main components, such as "soft fascination." The literature emphasized the importance of exposing young children to nature-based space and materials. It also explained the effects of nature on the children's development, particularly the development of concentration. Additionally, the graduate project described ART and some of its components as soft-fascination and nature deficit, analyzed the short-term effects of being exposed to nature-based space and materials versus the short-term effects of the early exposure to technology/online school. Lastly, the literature review discussed the challenges and opportunities early childhood educators face when designing and implementing both nature-based space and materials in the Children's House.

This research study explored the effects of using nature-based space and materials on the children’s concentration levels in an early childhood Montessori environment. Ackerman’s (2019) study suggested that spending time in nature or simply gazing at it gives individuals the ability to relax, reflect, and heal. Similarly, many years ago, Dr. Montessori discovered that children could reach their optimal potential when having free and independent access to natural spaces (Montessori, 1966). More and more research has demonstrated the positive effects nature provides to children, including cognitive
development, social and emotional development, and physical development. Claffey's (2016) research has also shown that children benefit from spending time in nature, including managing stress and facilitating respect for the natural world.

Additionally, Ackerman’s (2019) research study explained that natural environments could support individuals restoring attention, improving performance on projects or tasks, and improving resistance to and recovery from traumatic events in life. Thus, Ackerman’s (2019) study observed that when individuals are exposed to nature views from a window, they registered fewer physical illnesses and higher work satisfaction than those without a perception of nature, two variables that also influenced life satisfaction. As early childhood educators, it is vital to support the overall children’s development by exposing them to nature-based space and materials, especially during the first six years of life.

Ackerman's (2019) study explained how children could cope with mental exhaustion and develop the ability to focus and guide attention efficiently by being exposed to natural environments. Similarly, Keller's (2015) research demonstrated that when people spend time in nature, the mind and body refresh, curiosity and creativity improve, and the ability to focus radically increases. Thus, Welz's (2019) explored the effects of having contact with nature and proved that it improves necessary skills, for instance, balance and coordination skills. Moreover, including nature-based space and materials in the early childhood environment can promote positive benefits that will foster the child's healthy development, especially during crucial periods of growth.
Attention Restoration Theory (ART), Soft Fascination and Nature

Concentration is defined as “the action or power of focusing one’s attention or mental effort” (Oxford, 2010). In the Montessori educational approach, concentration represents one of the most critical aspects of children’s overall development. The Natural Learning Initiative (NLI) has suggested that proximity to natural environments, experiences, and everyday access improves children’s ability to concentrate and enhances cognitive abilities (NLI, 2012). ART emphasizes that nature can help develop attention and concentration skills (Ackerman, 2019). Ackerman’s (2019) research has explained how nature has the power to renew attention after experiencing mental fatigue. For instance, nature can help individuals refresh their attention after preparing for final exams.

Ackerman's (2019) research has shown that soft fascination represents one of the four states of attention. This third stage is an essential component of ART and signifies holding attention by an activity, which is less productive or relaxing. Ackerman's (2019) study explained that soft fascination enables individuals to be gently distracted and engaged in low stimulation activity, which decreases the internal noise and creates a peaceful inner space to relax. Thus, Ackerman's (2019) research explained that being exposed to nature can improve individuals' focus and ability to concentrate. ART is significantly related to this action research since it was characterized, as mentioned before, by the rapid improvement in technology and ever-increasing indoor entertainment.
Nature-Deficit Disorder

As educators, it is vital to understand the meaning of nature and the roots of our creation. Snyder’s (2008) study defined the word “nature which comes from the Latin *natura* – birth, constitution, character, course of things – and beyond *natura, nasci* – to be born” (Louv, 2008, p. 8). Differently, Ackerman’s (2019) study described *nature deficit disorder* as “a way to describe the psychological, physical and cognitive costs of human alienation from nature, particularly for children in their vulnerable developing years (Ackerman, 2019, p. 6). The phenomenon of *Nature Deficit Disorder* has been related to some modern epidemics of depression, obesity, and stress (Ackermam, 2019). The author Louv argued how humans often see themselves as a separate entity from nature when humans are also part of nature, of the wildness (Louv, 2008).

Based on Ackerman’s (2019) study, ART provides multiple restorative benefits. For instance, a view of a natural setting outside the window can help individuals in making a speedier recovery from stressful life events. Healthily using technology can also benefit humans. For instance, viewing scenic beauty videos can reduce pain and anxiety. Similarly, individuals who can view nature from the window have reported fewer physical ailments and greater job satisfaction than those without a nature view.

As mentioned above and as Claffey’s (2016) research emphasized, nature seems to have a beneficial impact on cognitive growth that offers children the chance to boost their concentration and cognitive functioning. In early childhood Montessori environments, concentration can be observed when children spend extended periods on a single activity—for instance, taking care of plants, polishing leaves, or washing fruit and
vegetables. Louv’s (2008) research suggested that it is vital to expose children to nature as it serves as a path for healing past emotional concerns. In the same study, Louv mentioned, “you’ll likely never see a slick commercial for nature therapy, as you do for the latest antidepressant pharmaceuticals. But parents, educators, and health workers need to know what a useful antidote to emotional and physical stress nature can be” (Louv, 2008, p. 49).

**Benefits of Nature and the Big Challenge (Technology)**

According to the author, Louv (2008), it is crucial to educate adults on the consequences of not being exposed to nature, especially during the first years of life. Louv mentioned, “by knowing the consequences, we also become more aware of how blessed our children can be – biologically, cognitively, and spiritually – through a positive physical connection to nature (p. 37). In recent years, the meaning of the term “ecopsychology” has evolved to include nature therapy, which asks what we do to the earth and what the earth does for us, for our health (Louv, 2008).

Based on ART and as noted previously, nature can benefit individuals by restoring attention, improving tasks' performance, and recovering from stressful events (Ackerman, 2019). For instance, Ackerman's (2019) study mentioned more restorative benefits of nature, including a speedier recovery with less prescribed drugs, less pain in patients facing bronchoscopy, reducing pain and anxiety in burn victims, improved attention in elders who were exposed to nature for one hour per week compared to those who were not exposed, increased attentional capacity in young adults with a view of nature, decreased aggression, and fewer physical problems and better job satisfaction in adults who work facing a nature view.
On the other hand, individuals who lack contact with nature can increase the risk of developmental disorders such as attention disorders or inadequate physical and emotional health (Keller, 2015). Similarly, Keller's (2015) research emphasized the need to expose children to natural environments as time spent indoors increases. The World Health Organization (WHO) has warned the world about the sedentary lifestyle we, as adults, continue to feed. The WHO has described this lifestyle as a global public health problem since inactivity is seen as a significant risk factor in non-communicable diseases, which has caused 60% of global deaths and 47% of the illness. For instance, the WHO related T.V. and junk food as the main factor of child obesity. In the U.S., children ages 6-11 tend to spend about 30 hours weekly looking at a T.V. or computer monitor (Louv, 2008, p. 47). Similarly, the National Center for Education Statistics (NCES) reported that in 2015, 94% of children ages 3-18 has a computer at home (NCES, 2015).

As early childhood educators, it is our job to stop the early exposure to technology and rely on more natural learning approaches to support children's healthy development. The early exposure to technology during the first years of life can increase the disconnectedness to nature and low development risk (Bento & Dias, 2017). Louv's (2008) research described some of the potential dangers children could face if they lack connection to nature. For instance, children could experience cognitive functioning disorders, diabetes, attention difficulties, among others. Claffey's (2016) study explained ART and recognized that nature could help restore an inhibitory neural network and help recover from fatigue. As the author, Louv's suggested, "there is a great need to educate parents about this research – to awaken or inspire the parents' pleasure with nature play – as the necessary context for continued nature experiences for their children. Such
knowledge may inspire us to choose a different path, one that leads to a nature-child reunion" (Louv, 2008, p. 32).

**Effects of Nature-Based Space & Materials on Young Children**

The author Louv mentioned a statement from the book Voice of the Earth by Roszak, “modern psychology has split the inner life from the outer life, and that we have repressed our “ecological unconscious that provides our connection to our evolution on earth” (Louv, 2008, p. 44). First, it is vital to comprehend the roots of natural spaces and the positive effects they have provided to humans throughout history. Louv’s (2008) study examined and provided a timeline based on the use of nature-based spaces throughout human history (Appendix A).

As research has shown, the evidence of gardens' therapeutic value and now pets is extensive and reliable. Orians, professor emeritus of zoology at the University of Washington, mentioned that our visual environment profoundly affects our physical and mental well-being (Louv, 2008). In 2004, Medco Health Solutions (MHS) reported that between 2000 and 2003, there was an increase of 49% in psychotropic drugs, antipsychotics, benzodiazepines, and antidepressant use. Similarly, MHS examined that medication for attention disorders appears in 49% of subscribed medicine.

According to Welz's (2019) study, balance and coordination skills are radically improved when children spend time in natural spaces.

Additionally, Welz's (2019) research emphasized the positive effects of using natural areas in early childhood education, specifically children's learning. Hyatt's (2019) research has shown that when children have the freedom to interact with natural areas, they can be characterized as being joyful, obedient, and attentive. Hyatt's (2019) research
has explored the effects of being exposed to activities that involve nature. For instance, children experienced high levels of curiosity and interest, leading to calm, peace, and concentration.

Similarly, the American Institute for Research (AIR) study showed that schools that implemented outdoor environments and other natural or green learning forms affected students' performance in social studies, science, language, arts, and math (AIR, 2012). Research has shown evidence of the positive effects of nature-based spaces. For instance, Ackerman's (2019) study described a study conducted by Thal, who examined the impact of conducting 20-minute nature walks and applied Kaplan's ART to describe the positive effects of being exposed to natural spaces individuals experiencing Attention-Deficit Hyperactivity Disorder (ADHD). As a result, those who completed the nature walk reported cognitive performance improvement and reduced ADHD symptoms.

Claffey's (2016) research explained that designing and implementing natural learning environments can help children avoid the implications of a lack of nature in children's lives. Fravel's (2008) study explored the multiple ways nature can support children in early childhood education. Fravel's (2018) study explained how nature could help children in math and art areas. For example, a set of rocks, shells, and leaves makes the sorting, counting, and patterning of materials inexpensive. Similarly, Fravel's (2018) study explained how pine branches, rosebuds, or grass could create natural brushes. Additionally, nature on a light table can be made for tracing letters and numbers. Fravel's (2018) research explained how these natural activities could be a way of learning, art, or math, for example. Similarly, the U.S. Department of Health and Human Services (HHS) emphasized the use of affordable natural settings and elements added to the early
childhood classroom. For instance, HHS recommended inexpensive natural materials inside the children's environment, such as a fallen tree, cut into long pieces. HHS mentioned that nature-based materials could become something else, like a seat in this case (HHS, 2018).

Ming Kuo described “Vitamin G,” G for green, to demonstrate the importance of having contact with nature for a healthy life (Kuo, 2012). Similarly, NLI showed evidence indicating that interaction with nature and green environments, like a vitamin, is needed at small, daily doses (NLI, 2012). Additionally, Samara’s (2019) research described the positive effects of developing a natural environment space in the early childhood environment and explained that when nature is impregnated with all facets of the classroom; it acts as a tool for achieving learning outcomes. Both nature-based space and materials inside the early childhood environment represent a new way of learning; the nature-based area also means a space where the children can re-charge freely and independently.

**Small Actions, Big Changes**

Ackerman's (2019) research has shown how rapid technological advancement and indoor entertainment have affected children's exposure to nature-based environments. However, in the last decade, researchers have studied the positive effects of natural habitats to increase exposure to nature, especially in early childhood education. According to Ackerman's (2019) study, experts have researched and developed guidelines to help society, including educators, understand the importance of time in nature. As mentioned previously, even looking at nature provides effects that can support children's healthy development. Similarly, based on Ackerman's (2019) research,
children exposed to nature, including those who experience stress and ADHD, can also feel nature's positive effects.

Experts, including early childhood educators, have the potential, as Dr. Montessori mentioned, to provide children with natural environments that will support optimal development. Dr. Montessori wrote, "we need to recognize that the love of the environment does not happen in the abstract; it happens in the natural world" (Montessori, 1966, p. 12). Ackerman's (2019) research demonstrated that natural settings could improve individuals' focus, increase problem-solving abilities, increase positive emotions, and reduce stress impacts. In the same study, the author recommends incorporating natural settings, especially in learning environments. Additionally, Fravel's (2018) research suggested introducing nature inside the early childhood environment and creating exciting objects for the children to explore.

**Conclusion**

Extensive research by recognized experts has recommended intentionally and meaningfully exposing children to natural environments in early childhood education. The effects of exposing young children to nature-based spaces and materials can lead to healthy development, especially during crucial periods of growth. As early childhood educators, we hold a vital responsibility; as Dr. Montessori suggested, we need to bring children back to nature and implement natural spaces and materials to support children's healthy development (Montessori, 1995). It is imperative to design well-prepared nature-based space and materials to support the children's overall development holistically. Both inclusions, nature-based space and materials in the early childhood environment
could be the medicine (or vitamin) for young children to experience joy, peace, calmness, concentration, and creativity holistically.

**Methodology**

This research study aimed to explore the effects of using nature-based space and materials on the children's concentration levels in an early childhood environment. Research studies have shown that nature can support the development of concentration holistically (Louv's, 2008). As early childhood educators, it is our job to naturally support the children's overall development, especially concentration development. Dr. Montessori studied the first years of the children's lives and discovered that they represent the most crucial human development period. Thus, it is vital to support children's natural skills holistically. The researcher, Mariana Villegas Ramírez, conducted this graduate project. Mariana is an early childhood educator whose experience in Montessori education started in 2015, after graduating from the University of Minnesota with a bachelor's degree in Human Resources Development.

After experiencing the lack of exposure to nature-based spaces in the Midwest, mostly due to the extreme cold weather, the need to be in contact with nature progressively increased. In 2019, the researcher received her AMI Diploma from the Training Center of Minnesota. Lastly, in 2019, the researcher continued with a graduate program in Montessori education from St. Catherine's University, concentrating on the effects of using nature-based space and materials on the children's concentration levels in an early childhood Montessori environment. Specifically, this research study was conducted at a non-profit early childhood Montessori school located in a mid-western state's central metropolitan area. Two guides and one
assistant supported this Montessori Children's House. As mentioned previously, 47% of the participants were refugees in the US, and this was their first year in an authentic Montessori environment. As described in the section below, the subjects for this study involved nineteen early childhood children. A total of eleven morning work-cycles were observed in the Fall as part of the research project. A total of eleven early childhood students were female, and eight were males. Lastly, eleven of the participants were refugees.

Both nature-based space and materials were designed and implemented in the Children’s House to explore the effects on the children’s concentration levels. The researcher set up both interventions during the last week of October 2020. The nature-based space and materials were located in the center of the children’s environment, where natural light could feed the plants (Appendix B). A total of fifteen plants were placed in the new nature-based area to distinguish it from other areas in the Children’s House. To best support the children’s needs in this area, other items such as a small fountain, a green carpet, and a small bench were also included. All the plants included in this area were non-toxic and were approved by the Department of Human Services in Minnesota (DHS).

The data collection process began with the baseline data step during the third week of October 2020. Each session of the data collection process was conducted for twenty minutes, three days a week: Mondays, Tuesdays, and Thursdays. Before introducing both nature-based space and materials, the researcher collected baseline data on the children's concentration levels using an observational data tool (Appendix C). After collecting baseline information, the researcher introduced both interventions and
continued with the data collection process for three more weeks. The researcher provided a series of Montessori-based presentations (Appendix D) to gracefully and courteously use the nature-based space and materials. The Montessori lessons involved a series of conscious steps to support the child's independence when exploring the new area and materials. The research study relied on four observational data tools, including quantitative and qualitative data. In particular, the data tools included a pre-and post-concentration scale (Appendix C) and a tally sheet that notes the area in which the children chose to explore (Appendix E). These tally sheets showed the times the child used the interventions (Appendix F). Lastly, a feeling rating scale was used to measure how the early childhood environment felt during each data collection session (Appendix G).

Data tool 1 (Appendix C) focused on collecting pre-and post-data specifically on the children's concentration levels. This first step took place before and after, including the nature-based space and materials in the early childhood environment. Data tool 1 represented the cornerstone of this research study due to its content, which involves the time the children spent in a specific area during the data collection process. This data tool (Appendix C) also represented one of the study variables, time spent in an area in the early childhood environment. The primary purpose of Data tool 1 was to measure the children's concentration levels. Based on research, an average attention span is three to five minutes per year of a child's age (McKay, 2019). Accordingly, the researcher also relied on the Montessori scientific observation method to collect data regarding the children's concentration levels. For instance, Data tool 1 (Appendix C) included start time, the number of children working distracted, for less than six minutes. The number
of children working concentrated for at least six minutes and the number of children working deep concentrated for more than six minutes. Lastly, the researcher included the end time, the total number of each section mentioned above, and observational notes, including the children's general response around the Montessori environment throughout the 20-minute data-gathering session.

Data tool 2 (Appendix E) collected information about the areas in which the children chose to work throughout the data gathering process. This data tool (Appendix E) was used after including both interventions in the early childhood environment. Data tool two collected information regarding the use of the nature-based space and materials in the Montessori environment. Data tool 2 included information about the date, the start time, a tally section of the areas in which the children tended to spend most of the time, and the end time. Additionally, a section including observational notes was included as part of data tool 2. The data tool (Appendix E) represented the second variable of this research study. By knowing the time, the children spent in each area in the Montessori environment; the researcher explored the effects of using a specific area on the children's concentration levels in the early childhood environment. Simultaneously, data tool 1 (Appendix C) and data tool 2 (Appendix E) served as the pathway to measure the impact of using an area on the children's concentration levels.

Collectively, data tool 3 (Appendix F) collected information about the use of both interventions, nature-based space and materials. Data tool 3 included information regarding the date, the start time, a tally section of the times the children used both interventions, and the end time. This data tool (Appendix F) represented the third important layer of this research study. It directly supported answering the research
question about using nature-based space and materials on the children's concentration levels. Similarly, data tool three (Appendix F) was interconnected with data tool 1 (Appendix C). The researcher examined the two variables to measure both interventions' impact on the children's concentration levels. Additionally, data tool 3 (Appendix F) concluded with an observational notes section to record the children's general response using the nature-based area and materials.

Lastly, data tool 4 (Appendix G) collected information about the early childhood environment's atmosphere. Data tool 4 represented the daily reflection of the researcher at the end of the data collection process. This data tool was interconnected with data tool 1 (Appendix C), the overall levels of concentration in the children's environment throughout the data collection process. Additionally, data tool 4 (Appendix G) included a rating scale representing the environment's atmosphere during the data collection process. Data tool 4 included four prompts represented with a number. The numbers were rated from 1 to 4, one is great, two pretty good, three little chaos, and four chaos. Finally, data tool 4 (Appendix G) added information about the meaning of the environment's atmosphere. Specifically, the rating scale was represented as follows: *great* characterized most of the children exploring the environment concentrated, *pretty good* some of the children exploring concentrated, *little chaos* a few of the children exploring the environment with fewer distractions, and *chaos* almost no children exploring concentrated, meaning most of the children were distracted.

The four data tools mentioned above were intentionally created to be interconnected. The purpose of the data tools was to help answer the research question about the effects of using nature-based space and materials on the young children's
concentration levels. The researcher relied on four data tools to measure the impact of nature on children and the Children's House overall environment. The four data tools were analyzed and compared to prove the benefits of nature in the learning environment.

**Analysis of Data**

The research study aimed to identify the effects of using nature-based space and materials on the children’s concentration levels in an early childhood environment. Four observational data tools were used to help to answer the research question. The data tools involved qualitative and quantitative information. The first data tool (Appendix C) gathered information about the children’s concentration levels throughout the data collection process. The second data tool (Appendix F) collected information about the areas in which the children tended to spend most of the time. Thirdly, Appendix G noted the use of both interventions, nature-based space and materials. Lastly, the researcher collected information about the environment’s atmosphere during each 20-minute data collection session.

The data collection process started the third week of October 2020 and lasted four weeks. The researcher began the data collection process by gathering baseline data. Each data collection session occurred for 20 minutes, three days a week: Mondays, Tuesdays, and Thursdays. On Wednesdays, the children attended online school as part of the hybrid early childhood program. The subjects for this study included nineteen early childhood children, 11 females and eight males, attending a non-profit Montessori School in an upper Midwest region (Figure 1). The researcher collected data for eleven-morning work-cycles. Finally, 22 people were present during each data collection session, and eleven of the children in the research were US refugees.
Levels of Concentration Before and After the Interventions

This research study addressed the effects of using both nature-based space and materials on the children’s concentration levels in an early childhood Montessori school. To explore the impact of nature on the children’s concentration levels, the researcher developed an observational data tool based on Montessori scientific observation (Appendix C) to record the children’s concentration levels before implementing both interventions. To know if the nature-based space and materials affected the children’s concentration levels, the data tool (Appendix C) included information regarding the time spent on each area in the early childhood environment. For instance, this data tool had the number of children working distracted, the number of children working concentrated, and the number of children working deep concentrated. The observational data tool (Appendix C) included information about an average attention span based on research.
For instance, if the child was working on an activity for more than six minutes, the child’s concentration levels were elevated. On the other hand, if the child spent less than six minutes working on an activity, the child’s concentration levels were lowered.

The data gathered from the four observational tools was entered in Excel and analyzed to determine if using both nature-based space and materials affected the children’s concentration levels. For instance, the researcher examined the four data tools and found variables that best answered the research question. Data tool 1 (Appendix C) represented the first variable of this research study, as explained above. This variable reflected the children’s concentration levels during the data collection process. Secondly, data tool 2 (Appendix E) noted the areas in which the children tended to spend most of the time throughout the investigation. Data tool 3 (Appendix F) stated both interventions, nature-based space and materials, during the data gathering. Lastly, the data analyzed relied on a fourth data tool (Appendix G), representing a daily rating scale of the environment’s atmosphere.

Figure 2 is related to data tool 2 (Appendix C) and represents the children’s concentration levels throughout the data collection process. Figure 2 shows the number of times children spent in a specific area in the Children’s House. Specifically, this figure also involves detailed information regarding the number of children working deep concentrated, concentrated, and distracted. Each category has been color-coded as follows: light green represents deep concentrated, blue concentrated, and yellow distracted. The left axis represents each day of the data collection process, and the bottom axis shows the total number of children under each color-coded category.
Throughout the data collection process, the number of children working concentrated and deep concentrated improved after using both interventions. On day one, ten children explored the environment showing average concentration levels for at least six minutes. During day two, the total number of children working deep concentrated increased from two to seven children. On the other hand, during day three, after the children attended online school and were away for one day, the overall concentration levels decreased. Additionally, the total number of children working distracted increased from one to six children. Progressively, the total number of children exploring the environment deep concentrated increased from two to eight children. Day five represented a starting point in the Children’s House again since online school occurred on Wednesday.
During day five, the total number of children working concentrated improved from four to 11 children. During day six, the number of children working deep concentrated increased from three to four children. Similarly, during day seven, the number of children working deep concentrated increased from four to six children. On the other hand, during day eight, the number of children working concentrated reduced from seven to two children. However, the number of children working deep concentrated remained the same. Lastly, Figure 3 shows day nine, which represented an improvement in the number of children working for at least six minutes; the number increased from two to six children.

**Areas Chosen by the Children in the Montessori Early Childhood Environment**

Figure 3 represents a collection of the areas in which the children spent most of the time throughout the data collection process. The researcher relied on data tool 2 (Appendix E) to complete this process. As mentioned previously, data tool 2 represented one of the variables in this research study, the areas in which the children tended to explore. Data tool 2 (Appendix E) and data tool 1 (Appendix C) were interconnected variables that supported answering the research question. Figure 3 shows the number of times the children chose each area during the data gathering process. Additionally, the researcher color-coded each area in the Montessori environment, including the sensorial area, practical life area, math area, and nature-based area and materials.
The researcher analyzed the two variables mentioned above to reflect both interventions' impact (Appendix F). After knowing where the children tended to spend most of the time during the data collection process, the researcher explored the effects on the children's concentration levels after being exposed to a particular area in the early childhood environment. Figure 3 shows the different areas in which the children explored in the early childhood environment. Each area was color-coded, math area red, practical life area light green, sensorial area pink, and nature-based space and materials dark green.

In the beginning of the data collection process, 12 children chose the practical life area to work throughout the morning work-cycle. The practical life area is a place where children can explore and experience real life-related activities. These activities involve a
series of 'conscious life activities' such as caring for plants, washing, peeling fruits and vegetables, shoe polishing, etc. The Montessori environment's practical life area represents a space that provides meaningful life experiences to young children, with authentic hand-made materials based on the children's culture. During the same day of the data gathering process, three children chose the sensorial area as the place where they wanted to work. On the second day of this process, 12 children chose the practical life area and three the sensorial area to explore. On the other hand, during the third day and after attending an online school, the number of children exploring the sensorial area increased to nine children. Additionally, the number of children exploring the practical life area decreased to four children.

During the fourth day of the data collection process, the children were introduced to both interventions, nature-based space and materials. On this day, four children chose the practical life area to work; three children chose the sensorial area, and seven the new nature-based space and materials. On the fifth day of this process, the number of children working in the practical life area increased to five children. On the other hand, the number of children working in the nature-based area decreased to six children. However, the number of children exploring the sensorial area increased to five children. After attending online school and during the sixth day of the data collection gathering, the number of children working in the practical life area decreased to three children. Similarly, the number of children working in the sensorial area reduced to four children. Nonetheless, the number of children exploring the nature-based area and materials increased to seven children.
The seventh day of the data collection process showed decreased children working in the nature-based area and materials. However, there was an increase in the number of children working in the practical life area. Similarly, there was an increase in the number of children exploring the sensorial area to nine children. After attending online school, during the eighth day of the data gathering, the number of children working in the new space was reduced to three children. Similarly, the number of children working in the sensorial area decreased to four children. The number of children exploring the practical life area remained the same as the day above, four children. The last day of the data collection process showed an increment to six children working in the practical life area. Similarly, the number of children exploring the nature-based space and materials increased to four children. The number of children working in the sensorial area remained as the previous day, four children. Nonetheless, the math area was explored by two children for the first time during the data gathering process. Days tenth and eleventh represented the school closure due to COVID-19.

**Children’s Levels of Concentration & Atmosphere in the Children’s House**

Additionally, Figure 4 represents the relationship between the children’s concentration levels and the atmosphere in the early childhood environment during the data collection process. The researcher relied on data tool four (Appendix G) to complete this step. Appendix G used two different variables that showed the effects of using both nature-based space and materials in the early childhood program. This data tool noted the overall levels of concentration and how the environment felt at the end of each data collection session. The first variable of this data tool (Appendix C) indicated that 54% of the time, children were working concentrated, for at least six minutes. The second
variable demonstrated that while children worked concentrated, the early childhood environment's atmosphere felt 46% pretty good (Appendix G).

Figure 4. Atmosphere in the Children’s House throughout the data collection process.

After analyzing all four data tools, the researcher concluded that both interventions, nature-based space and materials, positively impacted the children’s concentration levels. Throughout the research study, the number of children working concentrated for at least six minutes increased. It was examined that six out of 11 days, the children’s concentration levels periodically improved. During the research study, the number of children working concentrated was higher than the number of children working distracted. On the other hand, when the children attended online school, the number of children working concentrated reduced, as noted above. Secondly, after attending online school, the researcher found that the number of children exploring practical life and sensorial areas reduced. Lastly, it was observed that when children
were exposed to both interventions, nature-based space and materials, both the levels of concentration and the Children’s House Atmosphere improved.

**Action Plan**

This study aimed to explore the effects of using both nature-based space and materials on the children's concentration levels in an early childhood Montessori environment. The research's main goal was to explore the effects of using nature-based space and materials on the children's concentration levels in a non-profit Montessori school. As the study has mentioned, nature can be used as an alternative or preventive therapy for children who have mental illness and attention disorders (Louv, 2008). The observational data tools indicated that as children were more exposed to the nature-based space and materials, the positive effects of nature were reflected throughout the research study. The children's concentration levels improved periodically, as 54% of the children worked concentrated for at least six minutes. Lastly, the Children's House atmosphere was positively affected by feeling pretty good 46% of the time.

The young participants chose areas in the Montessori Children's House, including practical life, sensorial, math, and nature-based. However, the results showed that early childhood students tended to spend most of the time in areas that involved nature, such as the practical life and nature-based area. This asseveration indicated that when children spent most of the time in areas that involve nature, the levels of concentration increased. As one researcher mentioned, "there is probably something peculiar to experiences in nature that work particularly well in attuning attention" (Louv, 2008, p. 74).

After completing the research study, findings indicated that children needed more opportunities to be exposed to nature-based spaces and materials to improve their overall
well-being. As prior research has shown, "natural settings are essential for healthy child development because they stimulate all the senses and integrate informal play with formal learning" (Louv, 2008, p. 86). The frequent use of nature-based areas and materials indicated to be the variable of showing higher levels of concentration and feeling pretty good. As an early childhood educator and after analyzing the collected data, it is essential to change the way we guide young children.

As educators and as research has demonstrated, "we should act now on the available knowledge and increase awareness of nature's power to improve physical and emotional health" (Louv, 2008, p. 53). Findings presented in Figure 4 shows how nature had the 'power' to improve the early childhood environment's atmosphere. After further analyzing the gathered data, children showed interest in activities and materials that included nature. Similarly, after using both interventions, nature-based space and materials, the children improved their concentration levels. For this and many other reasons explained throughout the research study, it is vital to design and implement opportunities that expose children to nature.

Based on the findings, the first course of action is to educate and expose adults, especially caregivers, to nature. As the founder and director of the National Religious Partnership for the Environment shared, "you have to start with parents. First and above all is for parents to understand this connection. The future is not about designing curriculum. It's about awakening to creation" (Louv, 2008, p. 302). Secondly, it is essential to include nature-based space and materials in the learning environment, regardless of age. Thirdly, it is vital to apply all knowledge based on nature researchers have provided for humanity's benefit.
Lastly, the researcher recommends further exploring the effects of being exposed to nature and technology on the young brain by using advanced devices that read and interpret the human brain activity. Additionally, it is recommended to apply our eighth intelligence (nature smart) to benefit young children. To conclude this project, the researcher recommends what Nabhan, the director of the Center for Sustainable Environments at Northern Arizona University and author of *The Geography of Childhood*, mentioned, "science is the human endeavor in which we are frequently reminded how wrong we can be. If scientists rely only on reason, then our work has no meaning. It needs to be placed in some spiritual context" (Louv, 2008, p. 303).
References


https://www.oxfordlearnersdictionaries.com/us/definition/english/concentration/


Appendix A

Table 1
Use of Nature as a Healing Alternative Throughout Human History

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Over 2000 years ago</td>
<td>Chinese Taoists created gardens and greenhouses they believed to be beneficial for health.</td>
</tr>
<tr>
<td>1699</td>
<td>The book English Gardener advised the reader to spend time in nature spaces. In the US, mental health pioneer Dr. Benjamin Rush (a signer of the American Declaration of Independence) declared, “digging in the soil has a curative effect on the mentally ill” (Louv, 2008, p. 45).</td>
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<tr>
<td>1870</td>
<td>The Quaker’s Friends Hospital in Pennsylvania used acres of natural landscape and a greenhouse as part of its treatment of mental illness.</td>
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<td>During World War II</td>
<td>Psychiatry pioneer Carl Menninger led a horticulture therapy movement in the Veterans Administration Hospital System</td>
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<td>1950</td>
<td>A wider movement emerged, one that recognized the therapeutic benefits of gardening for people with chronic illnesses.</td>
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<td>1955</td>
<td>Michigan State University awarded the first graduate degree in horticultural/occupational therapy.</td>
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<tr>
<td>1971</td>
<td>Kansas State University established the first horticultural therapy degree curriculum.</td>
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<tr>
<td>Today</td>
<td>Pet therapy has joined horticultural therapy as an accepted health-care approach, particularly for the elderly and children.</td>
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Appendix B

Nature-Based Space & Materials Photographs
Appendix C

Observational Tool 1
Number of children working, including levels of concentration.

*(10 minute-session)* *Tally*
*(make sure to record the name of the activity)*

**Purpose:** to include and know the child’s levels of concentration. *A normal attention span is 3 to 5 minutes per year of a child’s age. A 2-year old should be able to concentrate on an individual activity for at least 6 minutes (McKay, 2019).*

<table>
<thead>
<tr>
<th>Start Time</th>
<th># of children working distracted (concentrated for less than 6 min)</th>
<th># of children working concentrated (concentrated for at least 6 min)</th>
<th># of children deep-concentrated (concentrated for more than 6 min)</th>
<th>End Time</th>
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Observational Notes: General response of the children around the environment throughout the day.
Appendix D

Presentations

Presentation: Nature-Based Space: How to Use the Area

1. Invite the child.
2. Tell the Child, “I want to show you something very special today!
3. Walk with the child to the nature-based space.
4. When arriving at the area, stop for a moment and allow the child to absorb the new space.
5. Ask the child, “What do you see?”
6. Do not interrupt the child.
7. Now introduce the area, “This is our nature-based space! We use it when we need to take a break. You can have a sit here,” and show the space where the child can sit down and peacefully enjoy the area.
8. Thank the child for their time and remind them they can use the nature-based area anytime they do not see someone by the sitting spot.
9. Invite the child to also work in this area when it’s available.
10. Encourage repetition by saying, “You can also take care of these plants, leaves, objects, etc.”
Presentation: Zen-Sand Garden

1. Invite the child.

2. Tell the child, "I want to show you something very special today!"

3. Walk with the child to the nature-based space.

4. When arriving at the area, stop for a moment and allow the child to absorb the new space.

5. Do not interrupt the child.

6. Show the child the Zen-Sand Garden, pointing out its place.

7. Show the child how to carry the Zen-Sand Garden. Hold it with two hands, making sure you use movement analysis when placing the fingers on the sides of the tray.

8. Tell the child, "This is how we carry it." Hold it firmly with two hands, prayer way, walk straight, and slowly place the tray on the chowki or small table located in the nature-based space.

9. Have a sit on the child's left side (if the child is right-handed).

10. Tell the child, "This is our Zen-Sand Garden." Slowly, show the child how to trace figures, letters, or numbers on the sand. For instance, show the child how to trace the first sound of their names.

11. Invite the child to trace.

12. Show the child how to place the Zen-Sand Garden back as it was by flattering out. Hold the tray with two hands and slowly pick it up. Stop for a second and then sake three times, or until you see the sand as it was.

13. Tell the child, "Let me show you how to place it back on its place."
14. Slowly place the Zen-Sand Garden back and tell the child, "This is one of our nature-based materials; you can use it whenever it is available."

15. Encourage repetition.
Presentation: Natural Spaces Album

1. Invite the child.

2. Tell the Child, "I want to show you something very special today!"

3. Invite the child to unroll a working mat.

4. Walk with the child to the nature-based space.

5. When arriving at the area, stop for a moment and allow the child to absorb the new space.

6. Do not interrupt the child.

7. Show the child the natural spaces album, pointing out its place.

8. Show the child how to carry the natural spaces album. Hold it with two hands, making sure you use analysis of movement when placing the fingers on the sides of the album.

9. Tell the child, "This is how we carry it." Hold it firmly with two hands, prayer way, walk straight, and slowly place the album on the working mat.

10. Have a sit on the child's left side (if the child is right-handed).

11. Tell the child, "This is nature spaces album." Slowly, show the child how to take out each card. Ask the child, "What do you see?"

12. If the child does not know, for instance, how the ocean looks like, say, "This is an ocean," or whatever the place might be.

13. If the child says, for instance, "This is an ocean," or "ocean," and the card does not correspond to an ocean, place it near you and make a note to present on a different day.
14. Start with 3-5 cards, depending on the child's vocabulary level. If the situation allows, provide vocabulary. For instance, when the child does not know what they are seeing, give a three-period lesson by delivering three new words.

15. *Three-Period Lesson:* Tell the child, "this is an ocean. Can you say ocean?" "This is a lake." "Can you say lake?" "This is a mountain. Can you say mountain?"

"Ask the child, "Please give me the ocean." "Place ocean back." "Please walk around holding lake." Please give me a lake." "Place mountain on your head."

"Place mountain back." Ask the child, "What is this?" allowing the child to provide vocabulary. Continue with the same process with the other cards. If the child does not remember the name, give another presentation on a different day.

16. Show the child how to place the materials back in their place.

17. Slowly place the natural spaces album back and tell the child, "This is one of our nature-based materials; you can use it whenever it is available."

18. Encourage repetition.
Presentation: Natural Leaves Exploration

1. Invite the child.
2. Tell the Child, "I want to show you something very special today!"
3. Walk with the child to the nature-based area.
4. When arriving at the area, stop for a moment and allow the child to absorb the new space.
5. Do not interrupt the child.
6. Show the child the natural leaves, pointing out their place.
7. Show the child how to carry the natural leaves by holding the materials with two hands.
8. Invite the child to choose a space in the nature-based area to explore the natural leaves.
9. Have a sit on the child's left side (if the child is right-handed).
10. Tell the child, "These are natural leaves." Slowly, show the child how to take out the leaves from the pouch or place them on the table or chowki if they are in the glass container. Ask the child, "What do you see?"
11. If the child does not know, allow the child to explore freely.
12. Show the child how to use the glass-magnifier by looking at a natural leaf.
13. Invite the child to observe a natural leave.
14. If the child shows interest, slowly fade away – while still observing.
15. Once the child is done exploring the natural leaves, show to place the materials back in their place.
16. Encourage repetition.
Presentation: Fruit and Vegetable Cards Exploration

1. Invite the child.

2. Tell the Child, "I want to show you something very special today!"

3. Walk with the child to the nature-based area.

4. When arriving at the area, stop for a moment and allow the child to absorb the new space.

5. Do not interrupt the child.

6. Show the child the fruit and vegetable cards, pointing out their place.

7. Show the child how to carry the natural leaves by holding the materials with two hands.

8. Invite the child to choose a space in the nature-based area to explore the fruit and vegetable fruits.

9. Have a sit on the child's left side (if the child is right-handed).

10. Tell the child, "These are fruit and vegetable cards." Slowly, show the child how to take out the cards from the pouch or place them on the table or chowki if they are house differently. Ask the child, "What do you see?"

11. If the child does not know, allow the child to explore freely.

12. Invite the child to continue exploring the fruit and vegetable cards.

13. If the child shows interest, slowly fade away – while still observing.

14. Once the child is done exploring the cards, show the materials back in their place.

15. Encourage repetition.
Appendix E

Observational Tool 2
Observations of one child throughout the data collection process when she/he is not using the nature-based space.

Child’s Initials: ___________________________ Age: ___________
Weather: _______________ # of Children: ________ # of Adults: ___________

<table>
<thead>
<tr>
<th>Date</th>
<th>Start Time</th>
<th>Area when the child is not using the nature-based space</th>
<th>End Time</th>
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**Observational Notes**: General response of the child when using the
Appendix F

Observational Tool 3
Use of both interventions by one child throughout the data collection process.

Child’s Initial: __________________ Age: ________________________________
Weather: ______________ # of Children: __________ # of Adults: __________

<table>
<thead>
<tr>
<th>Date</th>
<th>Start Time</th>
<th>Tally: Times in the Nature-Based Space</th>
<th>End Time</th>
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**Observational Notes: General response of the child when using the nature-based space. Note specific materials used.**
Appendix G

Observational Tool 4

Daily reflection by the researcher (Mariana Villegas Ramirez) at the end of the data collection process.

Date: ____________________________ # of children _________# of adults

Prompts:

1. Overall, most of the children were working (levels of concentration) _____________________________.

2. Mostly, the environment felt _____________________________.

Rating Scale ~ How the Morning Felt

1. Great
   ☹️
   Great: most of the children were working and concentrating without distractions.

2. Pretty Good
   😊
   Pretty Good: some children were working and concentrating without distraction.

3. Little Chaos
   😕
   Little Chaos: few children were working concentrated with less distractions.

4. Chaos
   😈
   Chaos: almost no children were working concentrated, most children were distracted.
Appendix H

Observation Codes

Work State

- (wd) Working distracted with the activity – generally short in duration – less than 6 minutes.

- (WC) Working concentrated with the activity for a sustained period of time – at least 6 minutes.

- (DC) Child experiencing deep concentration for a sustained period of time without any distraction – over 6 minutes.