

**Inspiring Environmental Literacy and Appreciation in an Urban Montessori Upper
Elementary Classroom Without Easy Access to Nature**

By

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Abstract

Environmental Education (EE) is often praised by educators as an ideal way to integrate academic curriculum, encourage the academic, emotional and social growth of students, and promote conservation of the natural environment. With the many benefits of EE, also comes many barriers. This action-research explored the barrier of a lack of nature in an urban, public school in the Midwestern Montessori, E2 classroom. Data was collected using pre- and post-surveys completed by the students in the classroom concerning environmental literacy and appreciation. The researcher also observed classroom behaviors and adapted EE lessons to fit with the currently taught Montessori curriculum. The research showed that by adding plants and animals to the classroom environment along with connecting nature to what they are learning in other subjects, the students became more environmentally literate. It is concluded, that with more time, the student's environmental literacy would lead to environmental appreciation, to create people who are stewards of the land.

Keywords: environmental education, elementary, Montessori, urban school, nature, classroom, environment

Introduction

My Montessori school is a 'school within a school', the large campus covers an entire neighborhood block, with residential houses surrounding that. The playground is made up of concrete, recycled tires and plastic turf. The few boulevards around the school are made up of grass patches and a few trees. The closest park, which has a grass field and other living plants, is a 20-minute walk.

A topic that I am passionate about is environmental education. I truly believe that allowing children to experience and explore in nature will allow them to understand and gain an

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appreciation for nature. This leads to them growing up as adults to be stewards of the land, with the hope that some of our environmental issues would be reversed.

As I was contemplating my research project, I was frustrated by the lack of nature around my school to which I could bring my students. So I decided I would bring nature in to the classroom to see if that could have an impact on my students' relationship with nature. My goal with this action research project was to provide regular access to nature, along with integrating environmental education lessons into the Montessori curriculum so that my students can gain environmental literacy and appreciation. It may not be as good as getting them outside, but I believe it's a worthy alternative in order to get them connected to nature.

Literature Review

In today's society, where technology is ever changing, children can be found with their eyes glued to a screen and their fingers on a controller. This sort of dependence on technology leads to children spending less time outdoors which widens the gap between people and their natural environment. At home, children spend much of their time hooked to their devices. Often it looks the same when they come to school. In many schools today, children have one-to-one iPads, and teachers are strapped trying to fit in all of the curriculum. As a result, they don't give the children time to go out and explore nature.

Awareness of environmental issues has grown tremendously over the years, but the connection between people and the environment is still diminishing because of population growth, urbanization and land area loss. Environmental education has the potential to restore that connection and help us regain our balance with nature. According to a study by Bruyere Wesson, and Teel (2012), "Through contact with and learning about natural areas we can begin to mend

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this disconnection with nature. Environmental education has the potential to facilitate experiences that lead to this connection” (p.1). In order for students to gain environmental literacy and environmental appreciation, these essential concepts need to be taught in school. Along with benefits to environmental education (EE), there are also barriers. However, by developing curriculum and incorporating EE into the classroom, teachers and students can overcome those barriers.

Benefits of Environmental Education

Environmental Education (EE) has many benefits in addition to creating a healthier Earth. It is a vital piece of a child’s education, that helps him or her develop knowledge and adopt positive attitudes and behaviors to become an environmentally literate citizen. In addition, a study by Young and LaFollette (2009) demonstrates further advantages of EE: “Teaching children to respect and understand the environment and its associated problems not only contributes to creating responsible individuals, but can also help them in their overall educational experience. Students participating in environmental education programs showed improved reading, writing, and oral communication skills” (p.2).

Another benefit of EE is connecting and growing as a community. According to Yates and Brody (2014), urban school gardens are growing in popularity. Through the environmental activities of growing a garden, students are learning to grow their own food and gain an understanding of how their community is connected to the land by producing fruit and vegetables that are unique to their school’s garden, city and region. “The urban school garden can have many other benefits, such as an increased sense of place, connection to the land, and a developing sense of social justice” (Yates, Brody, 2014, p.3). As students take ownership of the

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work they do in the garden, they feel empowered and gain a sense of personal accomplishment and shared community responsibility.

Environmental Education also allows students to have a positive attitude about the environment. Drissner et al. (2001) discovered that “Researchers assume an important relationship between knowledge about the environment on the one hand, and environmental attitudes and ecological awareness on the other hand. The rationale behind the assumption is that ‘we can only protect what we know’. Furthermore, we can only miss a species if we have had some kind of attachment to it” (p.181). Therefore, EE provides opportunities for children to form a bond with plants and animals, which leads to a positive attitude towards and an appreciation for the environment.

Barriers of Environmental Education

While there are many benefits to EE, there are also barriers to incorporating it in to the school day. One barrier can be attributed to the rise of urbanization: as the areas around schools become more urban, nature becomes scarcer. It is increasingly difficult to find schools with a big natural environment right in the school’s own backyard. Teachers are having to find more funding to bring students on field trips or they must get creative and bring more nature into the classroom, which also comes with it’s own challenges. According to Schumacher, Fuhrman and Duncan (2012) “Eleven barriers to teaching EE in the classroom were identified in a review of the literature from the past 20 years. These included lacking: (a) relevant EE materials that can easily be linked to the curriculum, (b) natural spaces to conduct EE activities, (c) administrative support, (d) time, (e) teacher comfort and confidence with science, and additional issues such as (f) safety and liability, (g) funding for equipment and other supplies, (h) class size, (i) student

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interest in EE, (j) integration of “taboo” environmental issues, and (k) integration of EE into the school culture” (p.11).

Following an Environmental Education Developed Curriculum

With all the barriers that come with Environmental Education, there must be guidelines or a curriculum in place for teachers to follow to eliminate these barriers. Students are eager to learn about their environment. They are even more eager to take action on a problem that they can solve. According to Keach (1973) a curriculum that provides a framework, is action oriented and focuses on development skills for the students, especially the development of inquiry and decision making. (p.3). As stated in Young and LaFollette (2009), the Illinois public schools are trying to get more EE in their state standards. “The IL Learning Standards could be modified to clearly incorporate EE, which must be paired with fully integrated subjects, while also giving teachers the required in-service training for incorporating EE” (p.3). With EE incorporated and woven in the state standards, teachers are able to teach more EE in their classrooms.

Environmental Education in the Classroom

Because a barrier of EE is a lack of a natural environment close to the school, teachers are forced to take their students away from the school grounds. This costs time and money, and gives many teachers anxiety, because they are no longer in the comfortability of the school grounds. One way to solve this issue is by bringing EE into the classroom.

Support from colleagues is essential for teachers. This goes the same for teachers who are incorporating EE into their own classrooms. In Schumacher’s, Fuhrman’s and Duncan’s research (2012), they find that “the school has a number of cheerleaders [fellow teachers] who help to

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spread the word about the importance of EE and to help teachers establish lesson plans they can use with their classes. These cheerleaders do everything from speaking individually with teachers about specific lessons, to going outside with classes, to sending out a monthly newsletter called *Enviroscoop* that gives teachers ideas about lessons that can be implemented during the season or month” (p.146). This kind of support can be found nowhere else. Only other teachers know what it’s like to teach. A strong sense of community gives teachers a ‘support group’ feeling when they are struggling to incorporate EE into their classroom.

One way to have environmental education present in the classroom is by having small classroom pets. Classroom pets are an educational concept based on experiential learning aimed at expanding biological knowledge and developing positive attitudes towards small animals such as invertebrates and insects. Insects as classroom pets are often cast aside as many teachers may be uncomfortable with handling them or do not know how to care for them. But the fact is, raising insects in a classroom can be highly educational, as Sauer found in a study (1967). “They [insects] demonstrate all the attributes of life- growth, irritability, reproduction, and so on. They are smaller than most animals- a real asset when space is limited. Usually insects are readily available. Obtaining and maintain them is inexpensive” (p.216). Because invertebrate are essential for our ecological system, there is a need to raise awareness of and change attitudes towards invertebrates. Having insects in classrooms is a great way to do this. There is a need to raise awareness of invertebrates and insects, as Drissner et al. state (2011). “Precise knowledge about the biology and ecology of living creatures is especially important in order to create an emotional bond with plants and animals as well as to foster appreciation for the environment” (p. 180). Furthermore, classroom pets teach students responsibility. Students also gain self-confidence as the animals thrive in the environment.

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Bringing plants into the classroom can serve many purposes. Plants grown in the classroom can engage students in many different ways. For example, plants can serve as Science experiments. They could also provide raw material and inspiration for art and photography. Again, as Foster states (2011), building a connection is imperative. “Because they are living and depend on natural resources, plants grown in the classroom teach valuable lessons about the environmental imperative and provide opportunities for students to develop a connection with the natural environment.” (p. 24). Mary Lightbody, a professor in the College of Education and Human Ecology at Ohio State University, is an advocate for putting plants in the classroom. In her 2011 study, she states “do not be surprised if there is an increased numbers of students who want a turn helping care for the plants in the classroom. The initial work with plants in the classroom can lead into a study of larger plants on the school grounds and community, or it could lead to citizen science activities related to invasive species or an analysis of plant diversity at the school or in the local community or parks. At the very least, students will have an increased appreciation for the diversity of plants and their contributions to our lives” (p.55). One can conclude, therefore, that the incorporation of EE in the curriculum by bringing nature into the classroom promotes a broader understanding of the environment outside of the classroom and outside of the school environment.

An additional way to incorporate EE into the classroom is by integrating it into other parts of the curriculum as Erdogan, Coskun, and Usak (2011) assert: “[EE] can also be developed through art and literature when considering the interdisciplinary nature of environmental education. Literacy children’s books, for example, can be an effective tool to develop students’ environmental literacy” (p.45). Most teachers do read-aloud and/or book groups every day, so having a book that speaks to environmental related themes would be an

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easy way to incorporate literature and EE. Plants can also be used to integrate EE into the curriculum. Because they originate from all over the world and have histories tightly bound to human societies, plants provide links to geography, history and social studies. Foster (2011) states, “Plants grown in the classroom can also be bridges to folklore, poems, plays, stories, novels, and current events in which plants play decisive roles. For example, plants such as the Whomping Willow and the villainous Mandrake have starring roles in the adventures of Harry Potter. Average household plants have stories that can be told to students” (p. 24). For example, one plant that is fairly common is the Lucky Bamboo. The Lucky Bamboo has a history with the Chinese New Year. The Chinese culture gives this plant as a gift. “One stem brings good fortune, three stems bring happiness, five brings health, seven bring wealth, eight bring prosperity and twenty-one bring general good blessings” (Foster, 2011, p. 27). In order to manage the increasing curricular demands, teachers need to find ways to integrate two or more learning targets into one activity. At the same time, there is an expectation that teachers should be teaching curriculum that is culturally sensitive and teaches students the customs, cultures and beliefs of a wide variety of societal groups. Growing culturally significant plants in your classroom does just this and incorporates environmental education as well.

A further way to integrate EE into the classroom is through technology. Many school districts are pushing for the use of technology in the classrooms and teachers can take this demand and turn it into an environmental lesson. Susan and Nick De Bonis (2011) wrote an article about managing a paperless classroom through technology. “The paperless classroom is a hybrid class which uses no paper handouts or tests. It is designed to: 1. Improve the efficiency of the learning experience. 2. Facilitate learning. 3. Help students develop the virtual environment skills and competencies. 4. Contribute to the sustainability efforts of the campus.” (p.84). While

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having a paperless classroom forces the use of technology, there can also be many lessons taught about reducing, reusing and recycling, which can be extended out to the whole school and even to the community.

Concluding Remarks

Incorporating environmental education into the Montessori curriculum may take time, but there should be ample opportunities to do so. Firstly, the subjects in the Montessori curriculum are already integrated. In the Montessori curriculum, the Great lessons are an important and unique part of the Montessori experience. Traditionally, there are Five Great Lessons that are used to connect the entire Montessori curriculum before moving to more specific studies throughout the year. From the Great Lessons, comes culture, science, language and mathematics. From there, teachers can also blend in environmental education. Environmental education and Montessori's Cosmic Education (that we are all connected parts to a whole) go hand-in-hand. When students know and love the world around them, including their natural environment, they can continue to learn more about their place in the world and their purpose for being here.

Goals of the Study

The purpose on my action research project was to incorporate nature into my classroom so to inspire environmental appreciation and literacy. Being in a setting with limited nature outside our classroom, I worry that my students are not getting enough exposure to nature. I believe that it is important for children to have a strong connection to nature. The stronger the

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bond, the more they will want to take care of the environment as they grow older. Connecting to nature also gives children a sense of who they are in relationship to the rest of the universe.

Overall, my research aimed to answer, “Can Upper Elementary Montessori students in an urban school gain environmental literacy and appreciation when there is a lack of a natural environment near to the school?” Focusing on a Montessori environment, my research explores:

- How can I make direct connections to nature in my classroom?
- How can I encourage students to make observations about their surroundings?
- Can my students cultivate a larger appreciation for the small, seemingly insignificant organisms on earth?
- How will nature interventions influence or impact my classroom behavior/climate?

Methodology

Participants and Setting

The participants in this study were seventeen 4th and 5th graders attending an urban public charter Montessori school in the Midwest. The group consisted of ten boys (ages 9-11) and seven girls (ages 9-11). Out of the seventeen students, 10 had attended a Montessori Children’s house and had continued to be in a Montessori classroom.

This particular Montessori charter school is housed in a traditional school’s building. This building is located in the middle of a neighborhood. It is approximately a 20 minute walk to the nearest park and a 15 minute walk to some of the local businesses. The school’s recess yard is fenced in, containing two climbing gyms and a large field, made of green plastic turf. There are two courtyards in the school. One is for the preschooler’s recess; it contains a small climbing gym and a concrete path. The other courtyard has two picnic tables and a few plants along a

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concrete path. The building houses 520 students. 120 of those students belong to the Montessori school, ranging from age 4 (preschool) through 5th grade. This school has two Children's House classrooms, four Lower Elementary classrooms, grades 1-3 and two Upper Elementary classrooms, graders 4-5.

This action research took place inside one of the Upper Elementary classroom. This classroom is approximately 850 square feet, with two large windows, facing east, looking on to the nearby neighborhood. The classroom has two doors: one leads to the school hallway, the other leading to the library/workspace that is shared with the second Upper Elementary classroom.



Figure 1. Classroom Environment

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Figure 2. Classroom Environment

Materials

A variety of materials were used to conduct this action research project. Many of the materials used were also part of the basic Montessori science curriculum. The materials include:

- Parts of a Seed Nomenclature
- Incredible Journey Game
- Monocot and Dicot nomenclature cards and differentiation
- Drop of Water Story
- Geography Charts
- Botany Charts
- Taproots and Fibrous Roots nomenclature cards
- Symbiosis card examples and definitions

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- Cloud chart
- Leaf Drip Zone cards and examples
- How the Wolf Changed the River video- Key Stone Species
- Food Web Game
- Native WI Plant Stories

Some materials are a part of the Montessori environment and related to Practical Life

- Variety of plants- watering and caring for plants
- Pets, that the classroom is willing and able to care for and observe: Madagascar Hissing Cockroaches, Russian Tortoise, Painted Turtles, and Fish.
- Observation journals
- Vermicomposting bin
- Tea, tea bags and loose tea
- Plant cart: seeds, pots of different sizes, soil, vine polls, lights, watering can
- Hydroponic Tower

In addition to daily read aloud of *Wild Robot*, by Peter Brown (2018), there was also many other nature-related resources that are made to inspire curiosity and further research.

All students also have an iPad that they may use to research, take pictures, and share with one another their discoveries.

A prepared environment was an important part of the research as well so that students could work freely and independently as they explore nature through their follow ups.

Procedure and Gathering the Data

Before starting the action research, the researcher had two plants in her room, a fish tank filled with perch, blue gills and crappies and a tank of Madagascar Hissing Cockroaches. She used her plants and animals as practical life skills but had not incorporated them into any sort of curriculum. Before the process began, the researcher sent home a permission letter to the student's parents to get the approval for their children to take part in the action research study (See Appendix A).

Pre-Action Research Data

To gather the pre-action research data, the researcher invited students to journal for several days in a row to show how or if the students appreciated nature/the natural environment. Each day the students were given a different prompt. Prompt 1: Do you like to spend time in nature? Prompt 2: Are plants important? Prompt 3: Are humans responsible for taking care of the earth? Then the researcher gave an environmental literacy pre-test. (See appendix B).

Adding Plants and Animals to the Classroom Environment

During the research period, the researcher asked for plant donations to the classroom. She also invited students to bring in plants from home. Students planted seeds in pots of soil in the plant cart and planted seeds in the hydroponic tower. The researcher also brought in a new classroom pet, a Russian tortoise, and had her painted turtles come visit a few days as well. During the research period, students also created a classroom compost bin, while learning about the importance of worms to our soil.



Figure 3. Madagascar Hissing Cockroaches



Figure 4. Fish Tank, including Perch, Crappies, and Blue Gills

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Figure 5. Students introduce Marshall (the Russian Tortoise) to the cockroaches



Figure 6. Some of the plants that were donated or that students brought in

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Figure 7. More donated plants. The plants on the windowsill were ones the students started from seeds.

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Figure 8. Hydroponic Tower after it's been planted



Figure 9. Students plant seeds in soil

Incorporating Nature in the Curriculum

Several times a week, during the research period, the researcher taught lessons that integrated environmental education into the typical Montessori curriculum: Science, Geography, History, Language and Math.

In a traditional Montessori Upper Elementary curriculum, biology is a large part of the Science curriculum. So incorporating environmental education into the already well developed Science curriculum was simple. During the research period, the 5th graders started the Botany unit. Having many plants in the classroom enhanced the Botany lessons, showing students first hand, what they were studying. For example, the researcher had monocots and dicots examples, she also had plants with tap roots and fibrous roots, see Figure 10. The 4th graders studied ecosystems during the research period. Having insects in the classroom for the students to observe gave them a strong sense for how important all organisms are to the ecosystem.

During this research period, the 4th graders were learning about the geography of their state. The researcher taught lessons on native plants and animals in the area and the effects invasive species has on them. She gave lessons on the Driftless region, the area in the Midwest where the glaciers did not pass over the land. This sparked an interest in melting glaciers and the effects climate change has on different parts of the world, including their residing state. The 5th graders were studying the hydrosphere of the earth. The 5th graders learned where there are bodies of water on earth and why. The research gave a lesson on the importance of protecting our fresh water and keeping it free from pollution (Project Wet, 2011, p. 441).

The study of humans is a large part of the history curriculum in an Upper Elementary Montessori classroom. The researcher presented lessons on how early humans, before modern medicine, used plants for medicinal purposes, and still do so today, especially in the native

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American cultures. The researcher brought in loose tea and plants that could be used as tea (chamomile, mint, and lemon balm). As the students learned about the Native American culture and their history, they drank tea and learned about the medicinal effects it has on the body. The researcher also brought in plants with cultural history behind it. For example, the shamrock is thought to bring good luck and the Irish culture gives this plant as a gift around St. Patrick's Day. See Allan Foster's research (2007, p. 24) for more story examples.

To incorporate environmental education with Language lessons, the researcher had students take observational notes on the seed they planted. The students had to be precise and descriptive with their choice of words. Plant stories were used to teach students about the native plants in their area. These are stories with a set of clues for the student to match the story with the name and picture of the plant. Students practices reading to one another to discover the different species.

The researcher used several methods to integrate math and environmental education. During the research period, the 4th and 5th graders were working on statistics and graphing. The researcher introduced an activity called the "Incredible Journey" from Project Wild (2006, p. 155). Students pretend to be a drop of water and keep track of their journey as they "travel" through oceans, rivers, lakes, ground water, clouds and more. Students document their journey through tally marks and show their data through graphs and percentages. See figure 11 to see a picture example of the students participating in the activity. "Oh Deer" is another game from Project Wild (2006) that takes an environmental topic and adds a Math element to it. This is a simulation game where half of the children represent a deer population and the other half represent the habitat in which the deer live. Throughout this activity, the students learn that the deer population and habitats fluctuate due to drought, forest fires, overpopulation, etc. This

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activity is played in rounds and students track how many deer are left in each round. Students then practice graphing to show how the habitat and animal population connect with one another. See pg. 36 for more details. The researcher also had students measuring the plants and cockroaches as part of their observation journal.

Art and nature are a natural fit for one another in the classroom. The students used oil pastels and water color to draw a plant and show it's fundamental needs. See figure 12. In their research journals, the students drew sketches of their plants and did leaf pressing with crayons. 4th graders were studying biomes during the research period, so the research taught students how to draw animals from a smaller drawing or poster using the scale grid system.



Figure 10. Students eat their tap roots (carrots)

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Figure 11. Students collecting data as they simulate the journey of a drop of water



Figure 12. Students creating the plants they are researching out of oil pastels and water color

Reading Material

Every day, after the students came in from recess, the researcher would read aloud from a novel entitled “Wild Robot” by Peter Brown. The story is about a robot named Roz, who found herself stranded on a wild island. She learns to survive her harsh surroundings by learning from the animals that live there. As she learns more about the animals, she realizes the importance of each animal and it’s job it needs to do in order for the ecosystem to run smoothly.

The researcher also went to the library and borrowed many books about animals, plants, habitats, solar energy, wind energy, life cycles, etc. She displayed them on the shelf and allowed students to pick them up and read at their leisure or during silent reading time.

Anecdotal Observation Records

As part of the researcher’s attempt to documents the children’s interest and experience working with the nature-related materials in the classroom, the researcher kept observational records in her notebook throughout the course of the research period, these observations occurred every day for 15 – 30 minutes.

Exploring the Data/Results and Findings

Environmental Literacy Test

At the beginning of the research period, the researcher had the students take a small test to examine their environmental literacy. The test is a total of 12 questions. See appendix B for the list of questions created by the researcher. These questions were based off of what came naturally in the Montessori curriculum as well what the researcher felt was important to know

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living in this area of the Midwest. The average number of questions the students got correct was 6. With a range of 2 being the lowest correct answers and 10 being the highest correct answers. After six weeks of nature exploration, lessons, and experiences in the classroom, the students took the same quiz, this time the questions and multiple choice answers in a different order. The average number of questions the students got correct was 9. With a range of 5 being the lowest numbers of correct answers and 12 being the highest number of correct answers. See figure 13 to compare the pre-test and post-test data.

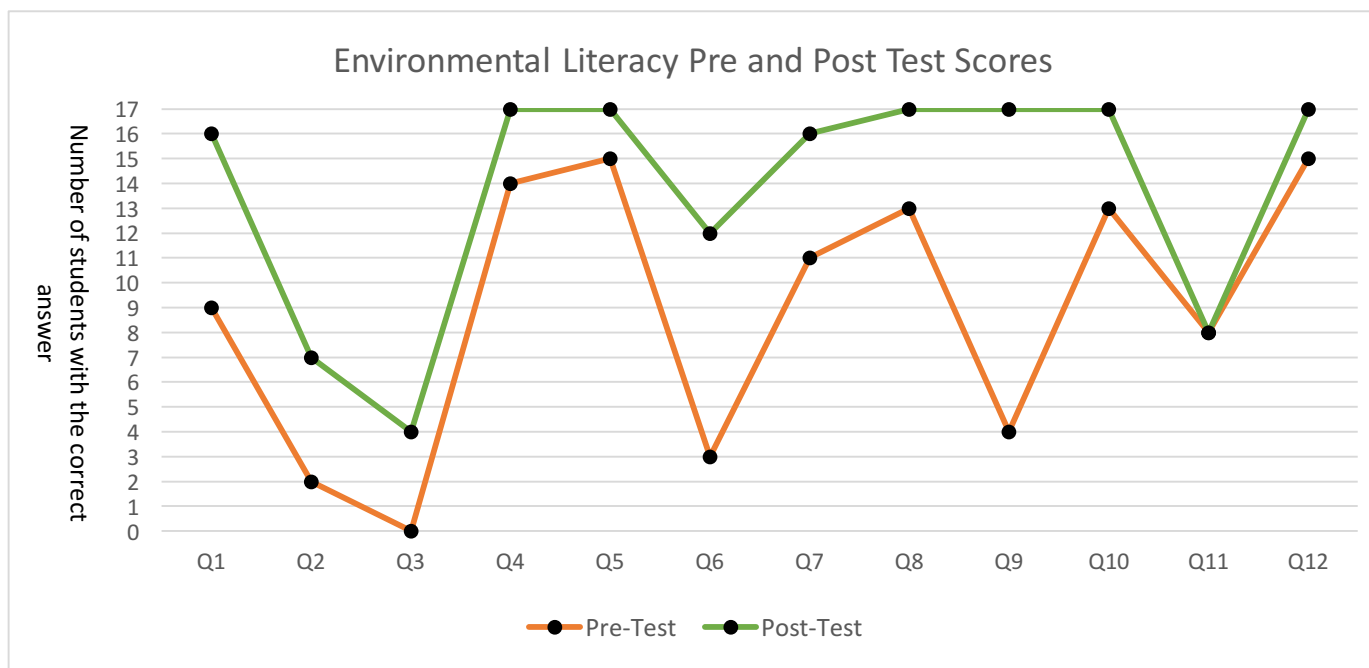


Figure 13 – Pre-test and Post test results

Environmental Appreciation Journaling

At the beginning of the research period, students journaled for several days about different topics related to nature. They were given a prompt to get them started on their writing. No two answers were the same, so below are just a few examples:

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Prompt #1: Do you like to spend time with nature?

At the beginning of the research period, the researcher received many different answers, below are example of some of the various answers:

Students 1: “Yes, because it’s fun. It’s fun because I get to play with my friends and get to do anything I want. I don’t like it sometimes because of all the bugs and mosquitos and cause its too hot or way too cold but mother nature can’t help that”

Students 2: “I like to spend time in nature because I have woods right next to my house and 2 swings tied to a tree. I also like to play with my dogs and ride my bike, although our driveway is too small to ride my bike a lot, but sometimes in the spring and summer we go for bike rides. In the summer me and my family go camping with our RV. It’s really fun. We call it “glamping” though because we have air conditioning, a bathroom and wifi.”

Students 3: “I like to spend time with nature because the sun gives you Vitamin D and I love to do homework outside in the spring because it is not cold but not hot and I love the fresh air and the peace and quiet and listening to the birds chirp”

Student 4: “No, it’s very noisy out there and a bear could appear. And it’s scary at nighttime.”

At the end of the research period, the researcher asked a similar question: Is nature something you can spend time with? Here are the responses from the same students:

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Student 1: “It’s fun to spend time with nature. I can play with my friends and have water gun fights and play tag. In the winter, you can build forts out of the snow and in the summer you can go swimming.”

Student 2: “You can spend time with nature by playing outside. You can swing and ride your bike. I have woods in my backyard that I can play in. We go camping in a camper, so I don’t think that really counts as spending time with nature, since we sleep inside and use the indoor toilet. But while you’re camping you can see the stars by the camp fire and hear all the insects. You can also go hiking during the day.”

Student 3: “I like to go outside and work on homework, especially when the weather is like it is today. We should go outside and work on the picnic tables now. I like listening to all the sounds of nature, it’s very peaceful.”

Student 4: “You can spend time with nature, but you have to be careful of the dangerous animals. Some animals are nice and you don’t have to be scared of them, you can just watch them.”

Prompt #2: Are plants important?

At the beginning of the research period, the researcher received many different answers, below are example of some of the various answers:

Student 1: “One thing straight off the bat is that plants are very important to bees and butterflies. They’re also used for fashion, aroma, and makes you go to sleep better. It is

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also edible, just in case you run out of food supplies. It's most important because plants are part of the beginning of the food chain."

Student 2: "Plants are good because it is a food source to other animals. Some plants give us oxygen like trees. If we didn't have plants, we would probably die! Some plants are just super cool looking, like the Venus fly trap!"

Student 3: "Plants help us a lot. They take in CO₂ which we breath out and let out O₂, which we breath in. We eat some plants. That's why I think plants are important."

Student 4: "Plants are important to animals and people because they make carbon dioxide in to oxygen. Plants also need animals to live because they do the opposite. Plants can make food too. They keep the soil together with their roots and can help keep it from being dusty. They can make shelters and people use plants, like cotton, to make fabric for clothes. They can be made into wood and paper. Plants can be used for medicine."

At the end of the research period, the researcher asked a similar question: What value do plants have? Here are the responses from the same students:

Student 1: "Plants are valuable because they do a lot for other things. They are the start of the food chain. Butterflies and bees need them for pollen and other animals need plants to eat. Humans also eat plants. We make clothes out of plants, and some plants smell really good, like lavender, which helps us to relax. And we can use plants to make tea, which tastes good and it's warm in the winter."

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Student 2: “Plants have value because other animals need plants to survive and we need plants and other animals in order to survive. So we would die without any plants! Some plants also do super cool things like making bugs attracted to them and making their seeds fly away from them. Some plants we eat and some plants we use them for medicine. Like the native American do, we still can do that too.”

Student 3: “Plants help us to keep us alive since they are the first thing in the food chain. They also help us breath since they take in CO₂ and let out O₂ which is what we need to breathe. So we should plant more plants so we can breathe better and have more food for other animals.”

Student 4: “Plants are very valuable. They help keep everything else on earth living. Without plants, everything else would die. Plants help keep the soil in place so it doesn’t run off into the rivers and clog them up. Plants also teach us stories about other countries, like the marigold. Some plants smell really good and some smell really bad, which some insects like. Some plants have leaves that keep the water so birds can get a drink when they need to.”

Prompt #3: Are humans responsible for taking care of the earth?

At the beginning of the research period, the researcher received many different answers, below are example of some of the various answers:

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Student 1: “Yes, because no one else is going to do it and if we want to live in a nice environment the we have to make it that way. The earth keeps us safe so we should do the same for it.

Student 2: It depends of how you think of it. In some ways, yes but also no. If humans didn't, animals or maybe plants would. In a way, humans hurt the earth, animals do not harm it.”

Student 3: “Yes, because there's a bunch of plastic in the rivers and oceans. And there's graffiti and people are making more of it. People are making more greenhouse gases and people litter. So people need to stop it.”

Student 4: “I think that humans are kind of responsible for taking care of Earth. Because people can help animals and plants but global warming is happening partly because of humans polluting the air. But some people are always trying to come up with things to help nature and can help sick animals and plants. But invasive species are to places because of people. So I think humans are responsible but don't always choose to be.”

At the end of the research period, the researcher asked a similar question. Here are the responses from the same students:

Student 1: “Yes, because humans are the smartest living organisms so we know how to take care of the earth and we take so much of the earth. We use all of it's resources and crops and oxygen. Without the earth we wouldn't be alive so we need to take care of

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ourselves. If we didn't take care of the earth, we wouldn't be taking care of ourselves.

The environment would die, we would die, and the animals would die. So yes, we need to take care of the earth.”

Student 2: “Yes. Humans hurt the earth in a lot of ways. Pollution, garbage, cutting down trees. So we need to stop doing those things. We have to do things that will help the earth, since we are the ones who use it. Like plant trees, bring back endangered animals, since we are the ones hunting them. We also need to recycle.”

Student 3: “Yes, because we seem to be the only living lifeform on this planet that can actually do things to harm the earth like global warming. We can also show kindness to it like recycling.”

Student 4: “Humans should take care of the earth. We are the ones that are making it worse. We have the power to change how we act; other animals can't do that. We need to stop having as much air pollution so the climate stops getting warmer. We can keep helping the animals that are becoming endangered and making laws to stop hunting them. We can help protect their habitat. Humans can do a lot; they just have to decide to do it.”

Interpretation/Analysis of the Results and Discussion

Environmental Literacy Survey

The results of the survey show that students can gain knowledge and understanding of the environment and the circumstances and conditions affecting it by bringing environmental education into the classroom environment. While I think that going out, into nature, may have a

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greater impact on student's environmental literacy, I think bringing nature into the classroom is a great alternative to schools and teachers who do not have the resources to go to a natural environment.

Environmental Appreciation through Journaling

I do not know if journaling really shows their true environmental appreciation. To me it showed through more as their environmental literacy. What is shown in the examples, hold true for the majority of the students. Their answers, after the research period, were more specific. They were able to tell me more details about the questions being asked because they knew more about the subject. I saw it most in the journal prompt asking: What value do plants have? For example, by the end of the research period, students were using words and phrases such as food chains, root systems, run off and plant histories. These were all things not mentioned before the research period. Overall, the students were able to be more specific about the reasons why plants are important. It leaves me asking if they truly gained environmental appreciation, or did they really just gain a greater sense of environmental literacy? I thought, through journaling, I would be able to see an increase in environmental appreciation, but I think I would need more time and probably a different method to gage whether or not an increase is shown.

Observation

Every day, I observed my class for 15-30 minutes. All year, the students have enjoyed the cockroaches and fish we had in the classroom, and that didn't change during the course of the research period. What I did observe was students observing the animals more. Two students wanted to know if the cockroaches change color before they shed, so they started an observation journal and learned that they get really dark. So now they can tell which ones are about to shed,

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so they don't get handled. The students added food to the worm bin, but from what I observed, there were not many conversations revolving the worms.

At the beginning of the research period, the students, in general, were not really interested in the plants I already had in the classroom. The botanist would water the plants every day, but other than that, I observed very little conversation revolving around the plants. Throughout the research period, as more and more plants were added to the classroom, I observed student becoming more aware of the plants around them. What really made the difference was when they planted their own plants. Students were very eager to water and care for their own plant and in turn became more aware of the needs of the other plants in the room. See figure 15 of students observing the seeds they planted. I also noticed a difference in the energy of the classroom. I have several students in my class that have trouble focusing on their work. They have difficulty sitting still, they distract others and they have not consistent with getting their work done. Throughout the course of the observation period, I observed on several occasions these students interacting with the plants for a short period of time and then being able to sit down and get work done. I also took note that they chose to sit in spots that were closer to the plants. The plants in the classroom had the largest effect on my student who has the biggest focusing issues. Instead of getting up and distracting his peers, he would go over to the plants he planted and touch them. I observed him running his fingers up and down the plant. Then watering the plant, dusting the leaves and rotating the pot. He did this with several other plant before he sat back down and went to his work. The energy he presented was much more peaceful than I had ever witnessed with him. By the end of the research period, the plants he had been taking extra care of, were flourishing and he had a sense of pride that he did not have at the beginning of the research period.

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Another aspect that I observed was that once the hydroponic plant tower was planted, the students did not pay much attention to it. Those plants did not need to be watered or rotated, the need for care for them was very limited. See figure 14 for the fully grown lettuce plant in the hydroponic tower. Students would pass by it, without even looking at it. But very rarely did a student pass the plant cart without checking on their seed sprout. I think the fact that they got their hands dirty and have to work to care for their plant makes a big difference in how important that plant is to them.

The students were not the only ones affected by the added experiences with the plants and animals. I was mindful of the affect the nature had on me. In my journal, I made note several times of the peacefulness the plants bring to my classroom environment. The beauty they brought made me feel happy. Having something alive and thriving brings excitement to the environment too. Because of this, I felt less stressed. All the normal stressors of the job didn't seem as heightened as they had in the past, and I believe my energy had an effect on the students as well.



Figure 14. Growing Gourmet Lettuce, ready to eat.



Figure 15. Students observe their seedlings sprout

Action Plan/Implications for further research and Limitations

Action Plan/Implications for further research

The time was too short to show any significant difference in my students' appreciation for the environment. But during my research, as I continued to add plants in my room, I felt my environment was more peaceful. In the past, during these late winter months, the time seems to slow down. The students get restless and I even feel the cabin fever getting to me. But this winter, with all the plants and animals I had in the room, I did not get that feeling. The energy in the room felt at ease and there was a lot less conflict with my students than in previous years; this, alone, is enough motivation for me to always have plants and animals in my classroom.

I would be interested to research the effects the nature in my classroom environment has on my student's behavior and general energy compared to my neighboring classroom which has zero plants and animals. I also want to research the effects incorporating nature into the classroom has on teachers. I know I feel more at peace when I am surrounded by plants in my classroom, than when I am not, I would be curious to know if other teachers feel the same way.

Limitations

I wanted to collect more insects as observation/exploration pieces, but because I did the action research during the winter months, most insect distributors would not ship them to me during this time because the animals would freeze.

I also had more outdoor games to play, on our playground field, but during the majority of the action research time, the field was covered in ice, so we could not go out there.

Time was also a limitation, especially with plants. In the time of 6 weeks, students didn't see their plants grow until they were mature. None of the plants had made it to the point where

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they were ready to harvest the fruit/vegetables. They also were not able to see the true effects of the worm bin. It takes months for the worms to decompose the food, so I think the worms would have made a bigger impact with more time.

Conclusion/Reflection

This research made me understand that without environmental literacy, there cannot be an increase in environmental appreciation. As humans, we like what we understand and get nervous around things/issues we do not understand. Environmental literacy and appreciation go hand-in-hand. I believe I effectively provided a variety of opportunities for the children in my class to develop a great sense of environmental literacy. I discovered that nature can be easily integrated into most areas of the Montessori curriculum. My hope, in the long term, is that because of all the environmental education they gained from being in my classroom, they will grow to have a sense of responsibility and respect for our Earth and ultimately pass that down to the next generation, creating a world that is reversing the environmental issues, instead of contributing to them.

References

- Brown, Peter. (2018). *The wild robot*. London: Picadilly Press
- Bruyere, Brett L., Wesson, Mark, & Teel, Tara. (2012). Incorporating Environmental Education into an Urban After-School Program in New York City. *International Journal of Environmental and Science Education*, 7(2), 327-341.
- Council for Environmental Education. (2006). *Project WILD: K-12 curriculum & activity guide*.
- De Bonis, Susan, & De Bonis, Nick. (2011). Going Green: Managing a Paperless Classroom. *Online Submission*, 83-87.
- Drissner, J., Haase, H., Nikolajek, M., & Hille, K. (2011). Environmental education in a 'green classroom'. *Resonance*, 16(2), 180-187.
- Erdogan, M., Coskun, E., & Usak, M. (2011). Developing Children's Environmental Literacy Through Literature: An Analysis of 100 Basic Literary Works. *Egitim Arastirmalari-Eurasian Journal Of Educational Research*, 11(42), 45-62.
- Foster, Allan. (2007). Roots of diversity: Growing culturally significant plants in the classroom. *Green Teacher*, (81), 24.
- Hachey, A., & Butler, D. (2009). Seeds in the Window, Soil in the Sensory Table: Science Education through Gardening and Nature-Based Play. *YC Young Children*, 64(6), 42-48
- Keach, E. (1973). How Do We Get Environmental Education into the School Curriculum? *The Journal of Environmental Education*, 4(4), 24-26.
- Lightbody, Mary. (2011). What's So Special about Plants? Inquiry in the Classroom. *Science Scope*, 34(8), 50-55.

ENVIRONMENTAL EDUCATION IN THE CLASSROOM

Project WET Foundations. (2011). *Project WET: Curriculum and activity guide 2.0*. Bozeman, MT

Sauer, R. (1976). Rearing Insects in the Classroom. *The American Biology Teacher*, 38(4), 216-221.

Shumacher, Stephanie L., Fuhrman, Nicholas E., & Duncan, Dennis W. (2012). The Influence of School Culture on Environmental Education Integration: A Case Study of an Urban Private School System. *Journal of Agricultural Education*, 53(4), 141-155.

Yates, K., & Brody, M. (2014). A Review of “Roots and Research in Urban School Gardens”. *The Journal of Environmental Education*, 45(2), 132-134.

Young, R., & Lafollette, S. (2009). Assessing the status of environmental education in illinois elementary schools. *Environmental Health Insights*, 3, 95-103.

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Appendix A

xxxxxx Montessori School
Address

School Logo

Dear Families,

This year, I am finishing my Montessori certification and Master's Degree in Education through the University of Wisconsin- River Falls. As part of this program, I will be conducting an Action Research Project in our classroom to inform and continue best teaching practices.

This project is in the early stages, but it will focus on environmental education in an urban setting. My overall goal is for my students to gain environmental literacy and appreciation even though we go to school in a setting where nature is not readily accessible. To reach that goal, I will be bringing more nature and environmental education into the classroom.

My final research paper will be submitted to UWRF's office of Graduate Studies and will be placed in the UWRF Intellectual Output Repository. My research findings will be presents to university peers, and may be submitted to the AMS Action Research Repository.

I would very much appreciate having your permission to record and report your child's progress in my project. I will use a pseudonym to protect your child's privacy and guarantee confidentiality. All students will be participating as part of our classroom day but data will not be used in the study unless you agree. Please note that you may withdraw your child's data at any time. Please sign this form and return it to me as soon as possible.

If you have any questions or concerns considering my research, please feel free to call or email me. If you have any questions about my University's research procedure, you can contact:

Diane Bennet, Ph.D.
Director of Grants and Research
University of Wisconsin- River Falls
Diane.bennett@uwrf.edu 715-425-3195

and/or

Melina Papadimitriou
melina.papa@uwrf.edu
715-220-2466

Sincerely,

Mariah Bigelow
ELL Teacher

_____ Yes, I grant permission for the use of the data as described above.

_____ No, I do not wish for data about my child to be used in this research.

Parent Name: _____

Parent Signature: _____

Date: _____

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Appendix B

Q1	What is it when two species benefit from their relationship with each other?
Q2	Which of these can help reduce the flow of storm water into a stream?
Q3	What is an underground layer of permeable rock, gravel, sand or silt where ground water collects?
Q4	Why is soil important to plants?
Q5	Which of the following would be affected the most if all the worms disappeared?
Q6	Which of these meals contributes the most to increasing methane in the atmosphere?
Q7	Why are greenhouse gases called greenhouse gases?
Q8	What is it when gases, liquids or particles in the air are in high enough concentrations to harm living things or the ecosystem?
Q9	Which species was widespread before WWII, went locally extinct in the 1970s due to pesticides, but came back in the 2000s due to the regulation of pesticides by the Environmental Protection Agency?
Q10	What is it when one species eats or hunts the other species?
Q11	What is one thing every plant has in common?
Q12	What are the places with everything a species needs to live, grow and reproduce?