

TEACHER AND STUDENT DISPOSITIONS TOWARDS USING A SCHOOL
GARDEN AS A CLASSROOM SETTING: A CASE STUDY

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by

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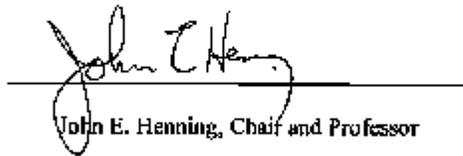
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This Master's Research Project has been approved

By the Department of Teacher Education.

A handwritten signature in black ink, appearing to read 'Frans H. Doppen', written over a horizontal line.

Frans H. Doppen, Associate Professor, Middle Childhood Education

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John E. Henning, Chair and Professor

DEDICATION

To my children, Marcus and Maggie who never get tired of looking at the world in excitement and wonder, my husband for all those late hours of bringing me coffee and providing child care, and my parents for supporting me always.

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CHAPTER ONE

INTRODUCTION

Organization of study

Chapter one presents an outline of the study, the idea of a school garden, the national trend towards school gardens and why it is important to implement such projects in our schools. The research question is presented, limitations, methodology, definition of terms and school demographics are explained. Chapter two is a review of the literature. Chapter three present the methodology used to collect and analyze the data. Chapter five presents the conclusions and suggests recommendations for the future direction of this project.

Background

Societies are dynamic entities and are changing now faster than ever due to technological advances at a rapid pace. Just forty years ago our country was speckled with family farms which were responsible for stocking grocery store shelves as well as their own cupboards, refrigerators, root cellars and smoke houses. The average television had three channels with no programming before the evening news and if you wanted to talk to someone you visited them, wrote a letter or made a phone call. Children played outside. People rode bikes or walked in order to travel to a short distance destination. Most families had only one car. One person per household was responsible to go to work and sustain the family by earning an income. The other person usually stayed at home and raised the family. These overarching general patterns have been displaced with a new lifestyle in which food is produced by large factory farms from all over the planet,

televisions have 100 plus channels with programming 24 hours a day and seven days a week, and people communicate via e-mail, Skype, text messaging or the ever present cellular telephone. The average family has at least two cars, often more because everyone in the family is off to the job, the baby sitter or one of many meetings. Families eat and communicate on the run, with less face to face time with each other and the surrounding community.

This hurried lifestyle supported by a large variety of electronic gadgets such as cellular phones, text messages, I-pods and computers has changed how we connect. Not just the human to human connection, but also the human to earth connection. We get to know one another on Facebook or Twitter. We get to know the planet through podcasts and Internet sites which tell us about what is happening out in the world, rather than experiencing it first-hand. Students know many facts about all kinds of animals across the planet from watching and reading online, on screen and playing video games. The question is, however, how much do they understand their local ecosystems and how they, as individuals, relate and depend on these systems.

One byproduct of this increased sessile lifestyle is the fact that obesity is on the rise; everything can be done from a car, a couch or a scooter by pushing buttons and making phone calls. Moving the body is no longer necessary to meet the needs of daily survival such as getting groceries, they can be delivered, or banking, usually done online. Research shows that kids spend 50% less time outside today than they did 10 years ago (Harmon, 2008, Louv, 2007). Data from the Ohio Division of Wildlife shows, for example, that the number of individuals who purchase fishing and hunting licenses has steadily declined (Appendix A). Likewise, visits to National Parks have declined as well

(Harmon, 2008, NPS). These numbers suggest less time spent outside, less understanding of the environment we depend on and less respect in the long run due to a lack of connection.

Louv (2007) connects the lack of healthy outside activity to increased diagnosed cases of children with Attention Deficit Disorder. Referring to this lack of outside activity as Nature Deficit Disorder, he makes a strong case by using examples that more activity outside helps children manage their activity levels better. Harmon (2008) argues that it is necessary to get children outside citing evidence that connects increased outdoor activity to lower blood pressure, weight loss, cognitive benefits, and reduction of depression and stress. Both Louv and Harmon argue that along with the gained health benefits, desirable behavioral outcomes can be detected such as increased environmental responsibility and a deeper understanding of the sciences connected to the world around us.

This is where schools and communities are important links in creating increased quality outside opportunities for the children. Wilson and Martin (1999) explain: “Just as the environment is an integral part of our lives, so education about the environment must be an integral part of the everyday learning process. It is a life long process and can not be left solely to our schools.” It takes a community to raise healthy and responsible children and adults. This education can take place at home, on a walk in the neighborhood or on the family farm, or at a community environmental center.

An environmental center can serve as a place for people to turn to for information and guidance about environmental concerns as well as valuable educational opportunities. Nomura, Hendarti and Abe (2003) describe this as a place where “local, regional, national and international issues are funneled into the centers, the information is

organized, evaluated, synthesized and disseminated, helping to enhance users' environmental knowledge and assisting environmental practices and activities." This is of importance, in particular, because more often than not, children take things at face value and often are not asked to critically think about the information presented. Information presented through the Internet requires critical thinking and guidance. A community environmental education center can encourage youth to use their critical thinking skills as they search through information presented on the Internet and through classes, discussions and activities.

In a world of bumper stickers urging us to "Think globally, act locally", "Respect Mother Earth", and "Leave no child inside," it is necessary to take these ideas a step further and act on them. It is necessary to increase valuable opportunities for adults and our youth to spent time outside and learn to be critical thinkers and a part of the environment which sustains us. It is necessary to increase understanding of what happens in our own backyards before moving into the global community.

Research question

The question remains how to connect this type of learning experience, learning about local environments, food sustainability and living earth friendly to a school curriculum that is overflowing with mandates, standards, testing and lack of time. Often well meaning, but overwhelmed, many teachers agree that many ideas presented at workshops are great, but that is remains a challenge how to implement them in a way that works with the school schedule and the state standards. It is important when proposing and implementing environmental education programs at public schools to understand teacher attitudes, student attitudes, administration attitudes, curriculum standards and

time constraints. Once these questions have been answered, a program needs to be designed based on these findings that fits the school, rather than on how the school fits the program. It is important to identify individuals who will be dedicated enough to follow through and try new approaches and to start small with little chance of overwhelming these individuals. The hope then is that the program will grow from there.

School gardens

School gardens have been sprouting up across the public school landscape, in urban as well as in rural schools. Gardens provide an attractive way to combine healthy living with meaningful learning. In a society with a public discussion on increases in childhood obesity and childhood diabetes, a school garden offers alternatives to the behind the desk, sessile learning environment. Gardens offer a way to open a discussion about food and healthy food, food sustainability, earth friendly living, local ecosystems, and microhabitats, just to mention a few. Research in Oklahoma schools found that a school garden club projects increased children's intake of fresh fruits and vegetables, along with outside physical activity (Herman, Parker, Brown, Siewe, Denney, & Walker, 2006).

A movement in California, started by a chef and a mother called "The Edible Schoolyard" offers many ideas, workshops and curriculum books on how to incorporate a school garden into the curriculum. Research is appearing on subjects such as whether a school garden changes eating habits in children, time outside caters to our standards and what constitute successful teaching strategies. These are questions being asked not just by academics, but also by teachers, administrators and parents. Often environmental programs such as a school garden are written off as a "cute" and "fun" but not a real

learning experience. Blair (2008) reports that in fact students in poor rural schools in Louisiana, which used gardening and the outdoors to enhance their curriculum over a three year time span, increased standardized test scores, improved attitudes towards learning, had higher GPAs and a better understanding of scientific concepts. Some of education movers and shakers, such as Montessori and Dewey, incorporated the idea of gardens into the teaching methods they developed (Blair, 2008). More recently, Blair has called gardens intensely local, a concept to intertwine community and learning as well as make relevant connections. In a world full of electronic disconnects, a garden can reconnect individuals through rediscovering their senses as well as human community.

Methods courses in teacher education colleges often encourage the concept of connecting learned knowledge to something that has personal meaning to students in everyday life. Once students understand the application of what they have learned to everyday processes it just makes more sense. Building raised beds and studying area in mathematics, studying Native Americans and planting a three sisters' garden, reading *Alice in Wonderland* and looking at mushrooms are just a few examples of how a school garden can bring relevance to subjects taught across the curriculum.

The practical implications of a school garden is the flexibility in how to design them and how big or little to make them. Gardens can be made for beauty, practical reasons such as food, they can be big, small, horizontal, vertical, in the country and in the city. The flexibility is endless and is only limited by a lack of imagination. They can start small and stay small or they can grow with a greater sense of wonder and excitement by students, teachers and volunteers alike. In addition, many grants are made available through local agencies, state agencies and clubs and agencies across the country.

Michelle Obama, our current First Lady, has planted a school garden by the White House, thus leading by example. (See: <http://www.thedailygreen.com/environmental-news/latest/michelle-obama-gardens-47022002>) This is where the connection to the real and concrete comes into play.

Limitations

1. Most research surrounding school gardens and related curriculum has been qualitative rather than quantitative. Much of it has been opinion-based.
2. This case study was conducted in a rural low socioeconomic school with no other schools to compare to, limiting the results to one demographic group.
3. The program was conducted in the winter and spring of 2011 in the fourth grade. If it were conducted during other school years and with other teachers and students' results might well differ.
4. I was directly connected to this project through funding, implementation and teaching at this school, therefore some personal bias may exist.

Definition of terms

- Curriculum Boxes: These are activity boxes which include lesson plans linked to the state curriculum standards and conducted in the school garden, all materials needed for the lesson plans and follow up activities and resource books. This enables teachers to conduct lessons with minimal time expenditure.
- Environmental Education: Programs for creating awareness about environmental issues in order to provide students with skills necessary to take responsible action for the environment (United States Environmental Protection Agency, 2010).

CHAPTER TWO

REVIEW OF LITERATURE

A historical perspective

John Dewey urged educators to connect intellectual and practical elements in their lessons. He was highly influential during the school garden movement in the early 20th century (Kohlstedt, 2007). He believed a school garden could provide just this kind of an experience for the learner: meaningful and practical with many intellectual elements present. A school garden culture flourished across the country between 1890 and 1920. Many schools, in urban as well as rural settings, taught part of their curriculum in the outdoor setting of the school gardens. This type of setting was inviting to the natural curiosity of the child in exploring the world around them. Subjects such as ecology, entomology, seasons, life cycles, and tree and plant identification were just a few subjects studied in the newly created school gardens. Wilbur Jackman (1904), who wrote the textbook, *“Nature Studies for the Common Schools”*, believed that the process of gardening was a way to stimulate the children’s curiosity and enthusiasm. He also believed that gardens provided opportunities for children to express themselves through individual projects or projects with peers under guided supervision. These projects can range from scientific and mathematic origin to literature and to art. He also stressed that this type of learning fostered an appreciation for beauty and nature, a chance for self-expression, acquisition of practical agricultural skills, and development of civic pride. School gardens were considered as deeply pedagogical and a most progressive way to teach children. This movement also opened up the doors to science education in the

primary grades. The subject was previously only taught in the high school grades. The school garden movement of the late 19th century proved its usefulness during World War I when many of these gardens supported food security in their surrounding communities. After the war funding for such projects was reduced and practically disappeared during the Great Depression. The lack of funding and the dire situation the country found itself in, took the momentum away from the school garden movement in America's public schools. As the country fought another World War and emerged from its challenges, the mood in the country redefined educational goals and approaches. In particular, the math and sciences moved more into the technological direction. With a post-war mood and a Cold War environment, as well as the launching of Sputnik, schools were encouraged to focus on math and sciences within the laboratory setting. The invention of new technologies took priority over the connection to the natural world (Wissehr, Concannon, Barrow, 2011).

A revival of the school garden

In the 1970's the country ran full steam ahead into an environmental crisis. Rivers were so polluted that they caught on fire, such as the Cuyahoga River did in 1969. Bald eagles were disappearing because of the use of extreme pesticides such as DDT. Books were published drawing attention to these catastrophes, Rachel Carson's "*Silent Spring*" (1962) and Dr. Seuss's "*The Lorax*" (1971) are just two of the examples. It became clear that humans, as a species on the Earth, were on the road to self-destruction. People had become more and more disconnected from the natural world around them. Technology and convenience were on top of the national agenda as well as competition with Russia about who might become the most technologically advanced nation on the

planet. Environmental disasters lead to a new awakening. This movement led to the Clean Air Act (1963) and the Clean Water Act (1977). The national mood became much more environmentally focused than it had been and this attitude influenced schools as well; however, the level extreme enthusiasm for the garden movement at the turn of the century had yet to be reached country wide.

Today, there are states such as California and Vermont which show a much higher level of dedication to this method of education (Blair, 2008). These states have public school districts and state superintendents who support the idea of an integrated educational program using a school garden. State wide curricula geared towards learning outdoors and connecting skills learned in a garden environment have been implemented. This movement is fueled by grassroots efforts from parents and educators alike. It has created small pockets of school districts, schools and individual teachers across the country venturing from the traditional school setting into the school garden. Grants are being made available to teachers by the National Gardening Association (<http://www.garden.org/>) to encourage funding for such programs. Parents, teachers and community organizers see real value in teaching a curriculum outdoors, for the same reasons the movement at the turn of the century saw value in reconnecting students with their senses and helping them develop a deeper understanding of the natural world.

There is also real economic value to the trend towards school gardens. Organic produce is in high demand (<http://www.nytimes.com/2011/12/31/science/earth/questions-about-organic-produce-and-sustainability.html>). Skills such as gardening and farming can help meet this demand in the market, creating new niche employment opportunities for school graduates. Opening this window of opportunity to individuals at a young age

and continuing this trend throughout students, educational tract will ensure a strong basis of knowledge and skills if they choose to become one of those organic farmers after graduation.

Finland has taken a more direct approach on getting students connected to their environment than any other country, and has shown that the educational outcome is invaluable, ranking its schools as some of the best in the world with some of the highest test scores (Louv, 2008). Less emphasis on testing, more emphasis on connecting has proven to be a good idea in this small country which is used as an example to many other countries. Students, who graduate from Finland's schools are quoted as some of the best educated in the world, due to their high scores on standardized tests, high graduation rates, high level of post high school education and high annual incomes as adults (http://www.stat.fi/til/kou_en.html).

Finland leads by example, showing that a holistic approach is necessary in combining today's needs in our education system and that it is possible to combine a school garden with deeper learning and learning outcomes.

Case studies

Ross and Frey (2002) explain how integrated approaches of science and literacy through hands-on learning in a garden environment can combine two learning outcomes. It combines increased literacy by using text connected to the garden curriculum and increased content knowledge in subjects such as science due to the nature of the garden. Using the school garden as a catalyst adds real world learning components to the lessons. When two learning outcomes are combined, the lack of time factor has been eliminated. Often teachers argue that there is not enough time to teach it all, but this approach

combines learning goals, hands-on experiences, and connection to the real world. It takes less time because of the wide range of needs covered with one well planned lesson. Ross and Frey (2002) argue that the teaching of science should be viewed through the lens of inquiry rather than the static collection of facts. This point of view can be expanded, meaning that this should be true for all subjects, not just science.

Howard Gardner has presented us with the concept of multiple intelligences (Gardner, 1983). He explains that educators are presented with a spectrum of learners including spatial, linguistic, logical-mathematical, bodily kinesthetic, musical, interpersonal, intrapersonal and naturalistic learners. The escape from the traditional teaching setting of the indoor classroom, behind a desk, to the school garden, may open the door to new teaching styles and accommodate a variety of learners.

The case study of Mrs. Diaz's second grade classroom provides a good overview how an integration of subjects such as language arts and science can be achieved throughout the school year by choosing connected texts and in-class activities which can then be extended into the outdoor classroom or school garden, making deeper connections and enabling a more meaningful learning experience (Ross & Frey, 2002). She introduces the topic in the classroom with a book and a reading and writing assignment; she follows up with an activity in the garden linked to the sciences and reviewing the language arts, and concludes by bringing it all together in a lesson covering the language arts, math or social studies components. This cross curricular approach proved to be efficient for Mrs. Diaz and fun for her students.

School gardens are not only academic tools but also human connection tools. It is often forgotten that schools are places where human beings meet and spend time together.

Mrs. Kafka started a school garden in her school in La Jolla, California. She describes her garden as a place where bonding happens: “When we go to the garden as a class, at the end of the day, there is a strong feeling of shared joy and peace, no matter how hard the day has been” (Louv, 2008). In this case the garden does not only represent a teaching tool, but also a place where students connect. It is also a place to teach students tools how to deal with stress. It is often overlooked how stressful school can be for students. The rigor of day-to-day testing, learning, being with peers in positive and negative interactions can cause stress and stress can cause unhealthy situations. To teach students how to deal with these feelings of stress by digging in the dirt and being together is a positive outcome of school gardens and a lifelong skill to learn (Louv, 2008).

With such a significant emphasis on academics, standards and curriculum it is often forgotten what makes childhood special. One of the finer points of childhood learning is the ability to engage in imaginative play and a sense of wonder. Along with knowing how to read, hold a pencil, write in cursive, it is equally important to give students time to explore nature independently. E.O. Wilson, one of the world’s leading ecologists explains that in his point of view the best tool we can give our children as teachers and parents is the freedom to explore nature by themselves, roam in nature and be explorers without a script directed by adults (Baylon, 2010).

Examples of this imaginative play can be found in pre-schools and Kindergartens all over the country. Two Kindergarten students in Mrs. Smith’s class discovered several of their sunflower seedlings had been trampled and their stems were broken. Both students collected small branches and string and spend much time playing doctor to these plants, splinting their stems and talking to them. To everyone’s surprise, the sunflowers

survived and grew big and strong over the summer. This type of imaginative play should be encouraged as long as possible and a school garden can create just such an environment, inviting to discover and participate on a playful level. In another garden, preschoolers used a pile of brush as a fort and created a magical world of dragons and knights in participating in self-directed role play. Such healthy and fun interactions teach social interaction and how to feel comfortable in the out of doors (Bucklin-Sporer, Pringle, 2010).

School garden studies and findings

Dorothy Blair (2008) evaluated seven school garden programs across the country. She states that in the state of New York alone, which has created and implemented a state wide garden curriculum, 200 schools use such programs, 100 teachers have been trained and 11,000 students are being taught in a garden setting. She calls gardens intensely local, creating real world learning and teaching environments.

The seven programs she evaluated followed a variety of objectives such as developing life skills, changing attitudes, using the garden as a therapy tool for troubled youth, an increase in nutritional awareness, more community outreach, increased agricultural literacy, and environmental awareness. She found that gardens were used 69% of the time to teach health and nutrition, 30% of the time to teach environmental education, and 30% of the time self-esteem. She also found that 85% of garden programs exist in elementary schools, 38 % in middle schools but none in high schools. The following statistics came out of this overview of school garden programs: increased vegetable consumption by sixth-grade students in Idaho, diverse learning outcomes such as increased environmental stewardship, increased capacity to connect science to the real

world, a chance to experiment with natural and plant processes, learning about soils and recycling. One finding showed that most elementary teachers did not have good agricultural knowledge. Horticulture therapy was successful and used to increase self-esteem in troubled youth. Working in a school garden showed to enhance team work, increase communication skills and create positive personal relationships with adults and peers; In addition, it increased test scores and increased overall positive behavior in participating students.

One survey conducted by the National Garden Association, following up on 322 of their grant recipients showed that 5% of those schools who received a grant and used a school garden saw no value in a school garden; however the remainder of the schools, showed 92% satisfaction with a garden curriculum being able to meet academic requirements, teaching what states mandated schools to teach in a variety of subjects such as Science, Math, Language Arts and Social Studies. Teachers reported that 92% of the time science was the most taught subject in the garden, followed by environmental education 83% of the time, mathematics 69% of the time, language arts, 68% of the time and social studies 51% of the time..

Three studies (Blair, 2008) explored teacher attitudes and found that 63% of all teachers sampled at three schools had no interest in using a school garden and felt it was not an effective tool to teach. 61% of all teachers had no training or experience working in the out of doors or in a garden. Overall, teachers who had experience or training in this field felt more positive and comfortable using this teaching method. This finding showed that in-service and increasing field experiences during pre-teacher training are necessary to help with the implementation of such programs.

Reversing the trend

A trend has emerged over the past decade labeled “Nature Deficit Disorder” (Louv, 2008). In his book “*Last Child in the Woods*,” Louv explains how societal trends show people, and in particular children, spend less and less time outside exploring, participating in independent nature discoveries. He argues that this trend parallels the exponential increase in medicated youth for Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD). In 2008 the Children’s Data Bank (<http://www.childtrendsdatbank.org/>) showed that one of every ten male children, 11% of all male children, were diagnosed with ADD or ADHD and 5 % of all females were diagnosed with ADD or ADHD. These children have severe difficulty staying on task, concentrating on school work, sitting still and following through on activities. This type of disorder disrupts the academic setting in our schools and disrupts students’ ability to become successful. In order to be a successful individual in today’s schools it is necessary to sit still and to be able to stay on task. Students with these disorders experience an array of negative experiences in our public schools and often shut down at a young age and/or are labeled as learning disabled. Many public school teachers can attest to this situation.

Louv (2008) explains that students who have ample time outside, get physical exercise and who explore nature tend to have less of ADD and ADHD symptoms, such as the inability to sit still or to stay focuses, they tend to be more balanced. He suggests this trends of increased ADD and ADHD typical behavior rose across the country between 1991 and 2003. Due to decreasing test scores in many schools, programs such as physical education, recess, field trips and art were pushed aside to implement a more

rigorous academic program, in order to pass the test. One sports commentator, Steve Rushin of Sports Illustrated, has noted that inmates in Leavenworth had more time at recess than our children did (Rushin, 2010). He explains that there are no studies proving his point, but there are many anecdotal episodes he recites in his book by people directly affected by these disorders. More and more professionals in the mental health field, however, see a connection between these disorders and the lack of outdoor activity and learning. Some recent studies are present evidence of what many already knew (Kuo, Taylor, 2009); in particular parents of children diagnosed with these disorders. According to these studies, time spent outside, away from the business of modern life, surrounded by nature, has healing effects on these children.

A study conducted in 2009 further underlines the point Louv is trying to make throughout his book. Taylor and Kuo (2009) took 17 children who were professionally diagnosed with ADD and ADHD and divided them into two groups. All children were given the task of completing a puzzle without taking their medications. After this, one group took a walk in a suburban neighborhood, one group took a walk downtown and one group was shipped to a park for independent nature exploration for 20 minutes. Once the children returned to their indoor classroom after their walk, they were given the same task. The suburban and downtown group showed no difference in their ability to concentrate. However, the children who explored nature in the park with little direction drastically improved their scores, exhibiting a higher ability to concentrate and a more relaxed attitude.

In summary, the research literature suggests that spending time outside has a soothing effect on human nature. It connects students' senses to the world around them.

The question is how to make these important connections part of the taught curriculum as demands in our public schools mount. The evidence suggests, schools are heading in the wrong direction. While a school garden is just part of the answer in reversing this trend, it is an important stepping stone towards developing healthy human beings. It is a place where questions can be addressed in more depth, new ideas can grow, and old ideas are rediscovered. A garden is a place where learning and healing can begin.

CHAPTER THREE

METHODOLOGY

Background

In 2010, River Valley School District, located in southeastern Ohio, received a grant from the Wal-Mart Foundation to implement a school garden for the elementary school. This garden consists of several raised beds filled with soil in order to plant food crops. Along the edge of the food garden a perennial bed was constructed to attract wildlife and pollinators. A compost bin and a rain barrel helped students discover life cycles, decomposition and reusable resources as well as the water cycle. A hot bed helped with growing plants during the cold month of the year and a raised vertical garden was wheelchair accessible. Fruit trees and a split rail fence encircled this outdoor classroom setting. The science teacher and the after school Junior Gardeners tended to the progress of this garden along with community volunteers. The reason behind constructing a garden at the school was to add educational opportunities such as environmental education, connecting components of a variety of curricula and subjects to the real world and to get children outside and “turned on” to learning. The school district struggled to meet high marks on the annual state standardized test and state report card. River Valley Elementary School administrators were to open to new ideas which may enhance learning and excite students about learning.

River Valley School District is a low performing district which struggles each year to meet requirements by the Ohio Department of Education (<http://ilrc.ode.state.oh.us/>). According to the 2010-11 state report card, this district

struggles with a variety of issues such as the fact that 68.5% of the student population was considered economically disadvantaged, 16.4% were students with disabilities and the student population consisted of 96.2% white non-Hispanic students, indicating a student body with little cultural diversity. Although in the past two school years, 2009/20010 and 2010/20011, the district has been listed as “Effective,” but failed to meet “Adequate Yearly Progress.” Report card data by the state of Ohio suggest that the students listed as “Talented and Gifted” and students with disabilities have low test scores on the proficiency testing conducted at the end of the year. The attendance rate required by the state has not been met by River Valley Elementary School either. The school is looking for new strategies to keep kids in school and interested in learning and to improve school attendance, active learning and improvement of scores on the annual standardized test. All in all the school is looking to make a connection across the curriculum to create a more meaningful learning and teaching environment. When approached with the idea of a school garden the administration was open minded and excited about the idea, as long as all activities could be linked to the Academic Content Standards required by the state of Ohio (<http://ilrc.ode.state.oh.us/>).

When introducing new ideas it is important to be aware of prior knowledge to build upon as well as teacher and student attitudes towards the process. The purpose of this study was to identify prior knowledge of teachers in regards to teaching in a garden, personal interest and attitudes towards teaching a curriculum out of doors. The same is true for students who were surveyed in this study. The questions explored personal interests, personal and professional experiences, and overall attitudes towards taking a traditionally taught subject from the inside to the outside. The same survey (see Appendix

B and Appendix C) was given before a lesson was taught in the garden and after the lesson was taught in the garden. The teacher survey questionnaire consisted of nine questions ranging from 'yes' and 'no' style questions to asking for deeper analysis and explanations. The same was true for the student questionnaire which had a total of 11 questions. This qualitative study of attitude change over time will be helpful in order to evaluate the future progress and direction of the project. Teacher and student attitudes are essential in successfully continuing this type of a project. It is important to mention that River Valley Elementary School is a rural school with a majority of the students living in the country. Many of the students expressed in conversation and classroom discussion that they hunt, hike, fish and camp. All these activities are a part of the local culture and a number of families spent time together exploring the out of doors.

All 4th grade classes in this study were departmentalized, meaning they went to different classrooms and to different teachers for different subjects. In the beginning as well as at the end of the day they spend one and a half hour in their homerooms for homeroom instruction. A total of 165 students and 8 teachers agreed to participate in this study. The student questionnaire was completed on the day before the students were introduced to the garden classroom and on the day after the lesson was taught. All teachers were presented with lessons correlated to the state mandated curriculum, but modified to be taught in a garden environment. All materials, lesson plans, books and questionnaires were provided to the teachers. Subjects taught in the garden included math, science, language arts, social studies, art and special education. None of the teachers or students had used this particular garden prior to the study.

During this study I was employed by the school as the 4th grade science teacher and Talented and Gifted teacher to all 4th graders. I was available as a resource to help teachers with materials needed for the garden and plant identification if it was needed but I did not teach any lessons used for this research.

Data collection and analysis

All student and teacher participants completed the same questionnaires, ensuring consistency in the project and a higher rate of validity (Bernard and Ryan, 2010). They were asked not to put their name on the questionnaire to ensure the questions would be answered honestly without feeling judged. There were 'yes' and 'no' style questions and open-ended questions asking for explanations. After receiving verbal consent from the principal, the questionnaires (see Appendix B and Appendix C) were given to each homeroom teacher along with lesson plans and lesson materials. The teachers were asked to have their students complete the questionnaires the same day they received the materials and again immediately following a lesson in the garden. Once the first set of questions was answered, they were collected to avoid students making changes to their original answers. The second sets of questions were collected after the students participated in a lesson in the school garden. It is important to mention that the River Valley School District departmentalized the 4th grade 5 years prior to this study and that the lessons taught were only taught in each teacher's homeroom. This means students were only able to experience one lesson taught in the garden in one subject, depending on who their homeroom teacher was. The math teacher taught a math lesson in her homeroom, the science teacher science, the language arts teacher reading and writing, the art teacher drawing, the social studies teacher Native American history and the self-

contained special education teacher chose a math lesson. All teachers were homeroom teachers for the students they taught the lessons to, but these teachers were specialized in each subject mentioned and also taught these subjects to the rest of the fourth grade. The survey was only given to each teacher and their particular homeroom. This meant that students whose homeroom teacher was the fourth grade math teacher would be taught a math lesson in the garden, the fourth grade class whose homeroom teacher was the social studies teacher would be taught a social studies lesson in the garden, and so forth. The only teacher who was not a homeroom teacher was the art teacher. She taught art to the entire elementary school, but chose one of the fifth grade classes to teach a lesson to. This lesson took place in the newly constructed school garden. She had never used an outdoor setting to teach art before. All participating teachers completed surveys before the lesson and after the lesson. All surveys were completed and returned for evaluation.

The pre-survey and the post-survey were identical in nature; comparing attitude changes from before using a school garden to after using a school garden as a classroom setting. The surveys consisted of 'yes' and 'no' style questions, extended responses and questions offering choices to circle Likert-style responses. The first part of the survey was designed to explore prior knowledge and personal interest. It asked such questions as, 'do you garden at home?', 'what do you teach?' and 'how long have you been teaching?' The later part of the survey was designed to explore attitudes towards teaching outside. The student survey followed a similar design, exploring prior knowledge and personal interest in the first part of the survey and attitude changes towards learning in the school garden in the later part. Students answered questions such as 'do you garden at home?', 'do you think math can be taught in a school garden?' and 'do you like learning

out of doors and moving while you are learning?'. The pre-survey was given after the state test was completed near the end of the school year. The lessons were taught at the end of the school year after testing had ended and the post-survey was administered after the lesson.

The data collected is considered qualitative. Jacelon and O'Dell (2005) describe analysis of qualitative data as a creative process. A multitude of approaches can be taken to evaluate the data. Simple 'yes' and 'no' questions or questions which are categorized were evaluated using the paired t-test and the Fisher's Exact Test. Evaluation of the extended response questions demands a higher amount of interpretation and personal evaluation by the researcher. Jacelon and O'Dell (2005) call this stage the "story telling" stage of data interpretation. It is important to represent the data to the reader so it makes sense and it can be built upon with future studies. In this case the extended responses were evaluated as either positive or negative responses. For example, if a student answered it would be fun to do math in the garden, measuring plants and flower beds, this answer was considered positive. If a student answered that math cannot be taught in a school garden, this was considered a negative. If a student answered, "I don't know," this was considered a neutral response. The same approach was taken with teacher surveys. The teacher survey in addition to 'yes' and 'no' responses included Likert-scale questions. "strongly agree" and "agree" responses were rated as positive responses; "disagree" and "strongly disagree" were rated as negative; "neither agree nor disagree" was rated as a neutral. In the end positive responses were compared to negative responses and changes from before the garden exposure to after the garden exposure were evaluated to identify themes. Each 'yes' and 'no' question was evaluated using the t-Test

method (see Appendix C). The teacher surveys had eight participants; therefore Fisher's Exact Test was used. A free version online of the statistical software was used to interpret the data (<http://www.statpac.com/statistics-calculator/percents.htm>).

Chapter Three presented the setting and the participants in this study as well as the methodology that was used to analyze the data. Chapter Four will present the findings of the pre- and post survey responses that were completed by the student and teacher participants.

CHAPTER FOUR

FINDINGS

The student survey included introductory questions to assess prior knowledge and personal interests. The first two questions explored the students' favorite subject and asked them to explain why this particular subject was their favorite. Additional questions such as '*Do you garden?*', '*Do you like spending time outside?*' and '*Do you like to learn hands on?*' provided a deeper understanding of how the students liked to learn and how they felt about going outside for various subjects to learn a new concept. The remainder of the survey consisted of questions requiring a 'yes' or 'no' response and were evaluated using the t-test method (see <http://www.statpac.com/statistics-calculator/percents.htm>).

Similarly, introductory questions in the teacher survey explored what subjects they taught, how many years of teaching experience they had and whether they gardened at home. In addition, the survey included Likert-type questions. Similar to the student survey, the remainder of the teacher survey consisted of questions requiring a 'yes' or 'no' response which were evaluated using the same t-test method.

Student pre-survey

Questions in the student questionnaire were designed to explore prior knowledge, personal interests and personal learning styles. One finding from the exploratory questions in the student survey was that many of the students marked science as their favorite subject. When asked why science was their favorite subject, students stated that they enjoyed doing experiments and going outside to learn.

The student questionnaire also offered the students a chance to provide extended responses to questions that explored the idea of moving around while learning and whether a school garden can be a good learning environment. In the pre-survey students explained that they enjoyed moving around because it is fun. Twenty-one out of 165 students stated that moving around helps them get focused and figure out questions. Interestingly one student said moving around helps him because he is hyper. These responses exhibit different learning styles and also showcase an important point that students identified with Attention Deficit Hyperactivity Disorder or as “*hyper students*,” who have a hard time sitting still for long periods, benefit from this type of learning opportunity. A variety of extended responses had a range of statements that ‘exercise is healthy’ and that they did not like sitting at their desks all day long. For example, one student wrote, “I get all cramped up and stiff after a while and I think of other things.” On the other hand, eight students thought that it was a bad idea to move around while learning because they would not be able to focus and they thought it was disruptive.

When asked about learning in the school garden, students answered that learning can take place in a school garden, particularly when studying science and math. They suggested that the following concepts could be learned: life cycles, insects, soil, worms, weather, measuring area, perimeter, and studying shapes as well as counting flowers, making predictions and calculating crop yields. Four students focused more on the human aspect of a garden, such as donating planted food from the school garden to a homeless shelter, selling crops and donating earnings to a good cause, and learning how to plant a garden at home to help feed the family. Others thought it was a good environment in which to learn how to work with others and be able to be with friends. Nine students

indicated it was an important skill to learn to help with environmental issues. In a typical comment, one student wrote, “I like helping. It doesn’t matter what I will help with. School gardens help make the earth a better place and I think that’s more important than TV or videogames.” Two students expressed that they enjoyed a garden environment simply because of its beauty.

Teacher pre-survey

Eight teachers, representing the entire fourth grade, participated in this survey. Their responses to the introductory questions in the teacher survey (see Appendix B) indicated that they taught their specific subject to all fourth grade students. Yet, in addition they also all taught spelling and math during their homeroom hours. The garden lessons were taught during homeroom. The survey also revealed that teaching experience ranged from 2 to 35 years. When asked whether they had ever thought about taking the curriculum they taught out of doors, four teachers (1 Science, 1 Art, 1 Special Education, and 1 Reading) answered affirmatively. The remaining four teachers (1 Social Studies, 1 Language Arts, and 2 Math) responded negatively.

Similar to the student questionnaire, the teacher questionnaire explored the teachers’ background knowledge and personal interests with regard to attitude changes from prior to after teaching a lesson in the school garden. Three out of the nine questions in the survey required ‘yes’ or ‘no’ responses. Four teachers in this study commented on the positive attributes they thought a garden would bring to their curriculum. They liked the idea of being able to make “real life” and hands-on connections and to enliven the lessons they taught rather than being in the classroom all the time. The four teachers who responded they had never thought about teaching out of door indicated this was due to

having too little time to plan “outside of the box” activities, to only recently having gained access to a school garden, to having to prepare students for the standardized test at the end of the year, and a fear of losing the students’ attentiveness in an outdoor setting. These teachers also indicated they were not convinced teaching in an outdoor setting was such a good idea.

Five of the eight teachers thought that teaching in the garden would enhance the students’ understanding of the subject and three were indifferent or disagreed. The same numbers held true when asked whether a garden lesson would help students make connections between what was being taught and real world applications. When asked whether a garden lesson could be used as a bridge across the curricular, connecting subjects and concepts taught, six out of eight teachers either agreed or strongly agreed while two were either indifferent or disagreed.

Thus the data collected before teachers taught the lesson revealed an overall positive attitude and willingness to try this approach. It also showed that teachers know that it is important to help students make real world connections as five out of eight teachers suggested. One of the teachers referenced the concept of multiple intelligences (Gardner, 1983) and that a school garden would address a number of these. The discussion in the extended response section indicated a willingness to try these approaches. Five out of eight teachers agreed it was necessary to give students a chance to have hands-on experiences.

School garden lessons

The Math teachers taught a lesson on perimeter and area using leaves, string and grid paper. Students picked a leaf from the garden, lined the string up with the perimeter

of the leaf and measured the string with a ruler to understand the concept of perimeter. They also measured the perimeter of the raised beds. They traced the leaves on grid paper and counted the squares inside of the outline of the leaf to gain an understanding of area (White, Barrett, Kopp, Manoux, Johnson, & McCullough, 2006).

The Social Studies teacher taught a lesson about the ways Native Americans gardened (Denee & Peduzzi, 1995). Students actively planted a three sisters' garden, i.e. corn, beans and squash. They read a story about the three sisters' garden and made seed pouches out of felt and beads, a traditional craft Native Americans used to keep their seeds safe. They discussed how important it was for these people to have a successful harvest and how it would affect the survival of the native community

The Language Arts teachers taught a lesson about writing comics about insects in the garden. Students were encouraged to observe in the garden and record notes into their journals. They looked at animals such as worms, spiders, butterflies, bees, pill bugs, centipedes and praying mantises. The teacher read the book: *Diary of a Worm* (Cronin & Bliss 2003) to them in the garden. They then went back inside and designed a comic story about their animals.

The Special Education teacher mentioned that one of her five students had never seen a garden before and did not know what many vegetables looked like and the student loved it. She taught the math lesson explained earlier to her self-contained classroom.

The Art teacher took her students outside to create watercolor nature sketches. The results included a variety of pictures of butterflies, spiders, caterpillars and plants. She noticed how relaxed and focused her students were in the outdoor setting. She

decided to display the students' sketches in the school hallway where they were praised by teachers and students alike.

The Science teacher taught a lesson on the life cycle of plants and animals, planting seeds and observing them over time as they developed in the garden and bringing into the classroom caterpillars of butterflies, which were hatched out and released. This required multiple several trips to the garden for observations and collecting of food plants for caterpillars.

Student post-survey

Two questions on the survey, "*Do you garden at home?*" and "*Do you think you can learn math, reading, writing, art and social studies using a garden?*" revealed a significant change in overall attitudes with respective p-values of 0.03 and 0.01 (see Appendix D, 6-7). Whereas 52.12% of the students on the pre-survey indicated they gardened at home, 65.25% said they did so afterwards and whereas 31.52% on the pre-survey agreed they could learn math, reading, writing, art and social studies in a garden 47.46% did so afterwards. These two changes suggest that the lesson the students experienced in the garden led to significant positive change with regard to gardening at home and learning a variety of subjects in a garden setting. This finding suggests that just one lesson can change student's minds and behavior

Responses to '*Do you like learning by using their hands and being able to move around*'? showed no significant change; 89.08% answered 'yes' in the pre-survey and 88.98% did so on the post-survey (see Appendix D, 8). These numbers indicate a strong support among the students for this type of learning environment.

Several questions suggested overall ‘yes’ percentage changes towards a more positive attitude. ‘*Do you like to learn outside?*’ increased from 96.36% to 98.31%, and ‘*Do you feel you can focus and learn outside like you can inside?*’ increased 78.79% to 83.05% (Appendix D, 3-4). These findings suggest that the students in this study embraced the outdoor classroom as a positive and productive learning environment.

When asked ‘*Do you spend much time outside after school or during the weekend?*’ on the pre-survey 84.85% responded affirmatively, whereas 92.37% did so on the post-survey (see Appendix D, 5). However, it is plausible this change was due to a variety of other factors as weather and season can impact behavior at home.

On the pre-survey 32.73% of the students responded affirmatively when asked ‘*Do you like learning things by staying in the classroom and using the Smartboard, worksheets or a book?*’ whereas 24.58% did so on the post-survey. When asked ‘*Do you like reading about something you like to learn?*’ 76.97% agreed in the pre-survey while 71.19% did so in the post-survey (see Appendix D, 9-10). These findings also suggest that students liked the hands-on outdoors approach. On the pre-survey 87.27% of the students responded positively to the question, ‘*Do you like seeing and touching things in order to learn?*’ On the post-survey 91.53% did so (see Appendix D, 11), suggesting the students knew right from the beginning that they enjoyed touching and seeing things in order to learn which was confirmed by the garden lesson.

All students answered the multiple choice part of the survey but very few students took the time to write extended responses. Although the number of written extended responses in the post-survey was low, they nonetheless suggest that after the lesson, more were able to connect learning in a garden to additional subjects such as art, social studies

and language arts whereas prior to the lesson in the garden no subjects other than math and science were listed. Nine students responded that reading or writing about a garden could add to their learning experience and make it more in depth. Two students indicated they enjoyed doing art projects in the garden such as sketching nature. Five of the students explained that history can be taught by looking at crops and their history and how they influenced the way our country has developed.

Teacher post-survey

Eight teachers took part in the survey and all completed the pre- and post-survey. The evaluation of the data collected from these teachers was conducted using the Fisher Exact Test to calculate a p-value (<http://mathworld.wolfram.com/FishersExactTest.html>). The Fisher Exact Test has been designed to analyze data with low numbers of participants and using ‘yes’ and ‘no’ questions.

Teacher responses to, ‘*Have you ever thought about using a school garden to teach your subject?*’, ‘*Do you garden at home?*’ and ‘*Have you ever used a garden to teach your subject before?*’ showed no statistically significant change from pre- to post-survey (see Appendix D, 4,5,6). Interestingly, not all teachers answered ‘yes’ when asked whether they had thought about using a school garden to teach their subject or had indeed done so in a school garden. This should have been the expected answer since all eight participating teachers were required to think about teaching and indeed taught a lesson in the school garden. Unfortunately, none wrote an extended response to explain his or her reasoning.

Findings in the Likert section of the post-survey varied. When asked '*Do you think teaching in a school garden will enhance your students' understanding of the subject taught?*' six teachers agreed or strongly agreed while two were neutral. One of the math teachers commented in her extended response that it was a nice idea but not necessary and she felt it would only work for some students (see Appendix D, 7).

In response to the question, '*Do you think using a school garden will help students make connections between what is being taught and the world they live in and function everyday?*' four teachers strongly agreed, two agreed and two were neutral. The social studies teacher's response suggested she had become less skeptical. After teaching the lesson she noted that she was able to connect simple garden activities to the state standards in social studies. She also felt that it was important for students to understand where food comes from and how gardening can be important to communities:

It helps them to understand how cultures have planted food, why they wanted rich farm lands and even what happens in the farming regions here in Ohio. I noticed that they have very little knowledge of where our food comes from and how to grow it or what it looks like. They need to know how to do simple gardening.

All teachers either agreed or strongly agreed in response to the question, '*Do you think teaching in an environment such as a school garden will help students make connections across the curriculum?*'. One of the Math teachers explained that some math concepts can be transferred into the sciences. The Language Arts teacher stated that reading and writing in a school garden can combine language arts with science and social studies. The Social Studies teacher argued that journaling, keeping records and comparing historic data can combine language arts, math, science and social studies. The

findings in the teacher post-survey suggest that teaching lessons in a garden setting enhances their attitudes towards learning outdoors and opens their mind to new teaching and learning strategies. For example the science teacher who had taught for over 35 years in the district called it the *'hands on, minds on'* method of teaching. The findings also suggest that teaching in a school garden and experiencing student excitement has the potential to create a more valuable teaching and learning environment. As one of the math teachers wrote in her extended response: "By actually touching the leaves and manipulating the yarn when measuring, I think the students will remember longer. They will realize that the concepts are not just pencil and paper activities, but can be applied to the real world around them."

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

This study included eight fourth grade teachers and 165 fourth grade students. All participants completed a survey prior to and after learning and teaching a lesson in the school garden. Both surveys included the same questions. The questions consisted of 'yes' and 'no' choices, Likert-scale choices and extended response. The questions were designed to explore prior knowledge, personal interest, individual learning and teaching styles, as well as personal experiences.

The purpose of this Master's Research Project was to explore student and teacher responses to of a school garden as an integral component of a state mandated curriculum. The research literature tells us that school gardens have been used throughout the history of public education in this country. They have been used to address a variety of intelligences, to connect schools with the surrounding community, to enhance the curriculum, and to provide nutrition for students at the school. Case studies have shown how teachers have successfully used the gardening approach in bridging subjects and addressing state mandated curricular.

The findings of this study show that the majority of teachers at River Valley Schools were open to trying a new idea and they willingly took their subjects and lessons into the school garden. Students at the school appeared genuinely excited in the pre-survey about going outdoors and learning. The post-survey showed an overall increase in positive attitudes towards teaching and learning in all subjects taught in the school

garden. Teachers felt that they had successfully made the connections to the standards and they felt the garden was an effective tool to teach certain concepts that are germane to their subject. The students felt they learned a variety of tasks and stated in the post-survey that all subjects could be taught in the school garden. The teachers stated that using a school garden helps connect curricula and create a meaningful hands-on real world learning environment.

School gardens provide an alternative to more conventional classroom teaching methods. It helps students learn life long skills such as how to plan a garden, how to plant and care for a garden. Gardens not only help teachers teach across the curriculum, but also teach everyone involved where our food comes from. In addition, they encourage healthy eating habits and life styles.

Conclusion

As school districts have to tighten their belts and make due with less, it becomes more important to recognize local resources and to incorporate them into creating a meaningful learning environment at our schools. Field trips are cut and teachers are bound to report cards and state standards. In times such as these when schools are graded and compared to other schools it has become important to create meaningful learning experiences on the school grounds themselves. Mabie and Baker (1996) conducted a comparative study, where one group of middle school students in Los Angeles learned a science lesson in the school garden and another group learned the same lesson in the classroom setting using textbooks and worksheets. When pretests and posttest of both groups were compared, the garden project group exhibited improved higher order thinking, observation, comparison, ordering and communication skills.

Developing a school garden as a part of the curriculum is a time consuming endeavor and can be overwhelming, but as literature tells us, it has been used for decades in many situations with great success. The key to a successful school garden project is to build a community within the school. Administrators, janitors, teachers and community members all play an important role in making a school garden successful. Administrators have to be supportive and offer professional development opportunities. In times of increasing state mandates from the state and diminishing resources, teachers and administrators often appear too apprehensive to develop curriculum “outside of the box.” Many testing companies and websites offer lessons and applications that offer tools to get the passing grades. They offer a more technical approach which offers administrators instant feedback on “percentages passed” and which students need help using computer modules. Unfortunately, a garden learning environment does not give instant feedback but rather involves a more long-term and involved learning experience.

A field trip to the school garden does not cost anything and therefore fits into any school’s budget and can serve well to meet required curriculum standards. Ample examples across the country exist that school gardens can supplement school kitchen menus and selling the produce can contribute financially to the school budget. Administrators and teachers need to come together as a team to decide how to implement new teaching strategies. That is the only way a school garden can become a successful endeavor for all involved. Although one single teacher can make it a nice extra curricular after school experience, he or she alone cannot make a school garden a successful school-wide tool, all stakeholders in the school community need to be supportive.. The data in this Master’s Research Project is supportive of implementing a school-wide school

garden curriculum which will offer students a unique opportunity to learn beyond the classroom walls with little or no cost attached.

Recommendations

In order to evaluate a school garden curriculum and its impact on students and teachers more effectively, more research is needed. A school garden curriculum needs to be linked to required curriculum standards and supported by professional development opportunities for teachers. Data on the implementation and learning outcomes needs to be collected and evaluated. In the past, very little has been done to collect quantitative conclusive data on this subject.

A follow-up study to this Master's Research Project should include additional data on a series of multiple lessons in the school garden, not just one lesson. This would offer a more comprehensive look at change of attitudes over time, such as over the course of an entire school year. It would also be beneficial to offer professional development to the teachers prior to teaching the lesson which would serve to broaden individual perspectives and encourage cross-curricular teaching.

In addition, lessons should be spread out throughout the academic year and not concentrated at the end of the year after the state test as was the case in this study. In such a model the impact of school garden based lessons on the school's results on the state test can perhaps be made more explicit. Furthermore the survey needs to be redesigned in order to solicit more extensive comments in the extended response section. Finally, a mentor exchange program would allow schools to connect with other schools that have implemented successful school garden projects. This would be helpful and encourage involvement within and across districts. Learning by example is a tool that can be helpful

to teachers, administrators and students alike. It is also important not to exclude a school's support staff, such as janitors and kitchen staff as their inclusion will encourage everyone to be supportive and take ownership. Only by getting everyone excited and involved can a school garden become a successful part of the school curriculum.

APPENDIX A
DIVISION OF WILDLIFE DATA

Ohio Department of Natural Resources, Division of Wildlife
License Year Comparison 2007 through 2010
Ohio's license year starts March 1 and ends February 28 (29) each year.

Publication 5063
(R511)



Fishing Licenses										
Year	Resident	Non-Res Annual	Non-Res 3-Day	1-Day	Reduced Cost	Free	All Fishing			
2007-2008	685,374	30,641	34,069	67,886	25,970	83,696	917,636			
2008-2009	681,995	29,839	33,011	65,331	32,444	73,859	886,479			
2009-2010	703,598	32,983	32,955	63,219	42,074	69,476	934,306			
2010-2011	665,237	31,711	30,036	61,936	45,502	59,303	873,727			
Hunting Licenses										
Year	Resident	Non-Res Annual	Non-Res 3-Day	Youth	Apprentice Adult Resident	Apprentice Adult Non-Resident	Apprentice Youth	Reduced Cost	Free	All Hunting
2007-2008	298,828	29,741	1,527	62,282	1,480	250	11,145	9,775	34,534	439,562
2008-2009	304,658	32,024	1,519	61,774	1,639	259	13,246	12,372	31,316	448,607
2009-2010	305,527	33,576	1,496	61,452	1,831	230	14,492	15,091	29,028	452,723
2010-2011	294,565	36,487	1,353	49,832	2,056	243	14,718	16,756	25,024	441,124
Deer Permits										
Year	Deer Permit	Youth	Reduced Cost	Free Deer	Antlerless	Reduced Antlerless	Free Antlerless	All Deer		
2007-2008	347,691	65,647	9,425	54,406	84,136	1,161	15,900	578,366		
2008-2009	339,316	67,338	11,689	45,699	121,961	2,222	23,217	611,442		
2009-2010	339,817	67,828	14,135	40,668	133,860	3,042	25,558	624,908		
2010-2011	330,744	66,300	15,543	34,175	135,350	3,385	23,920	609,417		
Turkey Permits										
Year	Spring Turkey	Youth Spring	Reduced Spring	Free Spring	Fall Turkey	Youth Fall	Reduced Fall	Free Fall	All Turkey	
2007-2008	49,461	10,610	1,901	20,329	5,672	709	466	15,823	104,971	
2008-2009	50,062	10,592	2,429	17,047	7,483	1,019	722	14,377	103,731	
2009-2010	51,839	10,991	2,995	15,224	7,657	1,047	846	13,129	103,727	
2010-2011	51,243	11,089	3,497	12,842	6,824	929	874	11,039	98,337	
Fur Taker Permits										
Year	Fur Taker	Youth	Non Resident	Apprentice	Apprentice NR	Apprentice Youth	Reduced Cost	Free	All Fur	
2007-2008	13,708	1,939	317	162	5	325	574	7,275	24,305	
2008-2009	14,522	1,909	347	195	8	375	710	6,717	24,783	
2009-2010	12,962	1,655	322	151	13	309	617	6,068	22,327	
2010-2011	12,498	1,583	320	213	13	280	909	4,782	20,598	
Ohio Wetlands Stamp										
Year	Wetland Stamp	Reduced Cost	Free	All Wetland	Range Permits					
2007-2008	24,767	608	8,206	33,581	Year	1-Day Range	Annual Range	All Range	Duplicates	
2008-2009	24,535	803	7,127	32,465	2007-2008	19,960	5,316	25,296	10,233	
2009-2010	24,019	957	6,714	31,690	2008-2009	21,558	5,280	26,838	10,490	
2010-2011	22,669	990	4,611	28,470	2009-2010	23,392	6,452	29,844	16,854	
					2010-2011	26,010	6,733	31,743	16,768	

APPENDIX B
TEACHER SURVEY

1. What subject[s] do you teach?
2. What grade level do you teach?
3. How many years have been teaching?
4. Do you garden at home?
Yes / No [Please circle]
5. Have you ever thought about teaching your subject using a school garden?
Yes / No [Please circle]
Why or why not?
6. Have you ever used a school garden [or any other garden] to teach your subject?
Yes / No [Please circle]
Why or why not?
7. Do you think teaching in a school garden will enhance your students' understanding of your subject? [Please circle]
 1. Strongly disagree
 2. Disagree
 3. Neither agree nor disagree
 4. Agree
 5. Strongly agree
8. Do you think using a school garden will help students make connections between what is being taught and the world we live and function in everyday, making the topic more applicable to them? [Please circle]
 1. Strongly disagree
 2. Disagree
 3. Neither agree nor disagree
 4. Agree
 5. Strongly agree

9. Do you think teaching in an environment such as the school garden will help students make connections across the curriculum? [Please circle]

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

Please explain your answer.

APPENDIX C
STUDENT SURVEY

1. What is your favorite subject?
2. Why is this favorite subject?
3. Do you like getting outside to learn?
Yes/No
4. Do you feel you can focus and learn outside like you can inside?
Yes/No
5. Do you spend much time outside after school or on weekends?
Yes/No
6. Do you garden at home?
Yes/No
7. Do you think you can learn Math, Reading, Writing, Social Studies, Art and Science using a garden?
Yes/No
If yes, how do you think you can learn these subjects in the garden?
8. Do you like learning by using your hands and being able to move around?
Yes/No
Please explain why you like moving around or why you don't like moving around.
9. Do you like learning things by staying in the classroom and using the smartboard, worksheets or a book?
Yes/No
Why do you like learning this way?

10. Do you like reading about something you like to learn?

Yes/No

11. Do you like seeing and touching things in order to learn?

Yes/No

Do you think using a school garden to learn things can be a good thing? Please list some ideas you have about things you find important and you can learn by using a school garden:

APPENDIX D

SURVEY DATA

Student
Questions:

				Percent- Yes	P- Value
Question 3					
	Yes	No	Total		
Before	159	6	165	96.36	
After	116	2	118	98.31	
Total	275	8	283		0.33
Question 4					
	Yes	No	Total		
Before	130	34	165	78.79	
After	98	20	118	83.05	
Total	229	54	283		0.37
Question 5					
	Yes	No	Total		
Before	140	25	165	84.85	
After	109	9	118	92.37	
Total	249	34	283		0.06
Question 6					
	Yes	No	Total		
Before	86	79	165	52.12	
After	77	41	118	65.25	
Total	163	34	283		0.03 Significant difference
Question 7					
	Yes	No	Total		
Before	52	113	165	31.52	
After	56	62	118	47.46	
Total	108	175	283		0.01 Significant difference

Question 8

	Yes	No	Total
Before	147	18	165
After	105	13	118
Total	252	31	283

Percent-Yes	P-value
89.09	
88.98	
	0.98

Question 9

	Yes	No	Total
Before	54	111	165
After	29	89	118
Total	83	200	283

32.73	
24.58	
	0.14

Question 10

	Yes	No	Total
Before	127	38	165
After	84	34	118
Total	211	72	283

76.97	
71.19	
	0.27

Question 11

	Yes	No	Total
Before	144	21	165
After	108	10	118
Total	252	31	283

87.27	
91.53	
	0.26

Teacher Survey

Question 4

	Yes	No	Total
Before	7	1	8
After	7	1	8
Total	14	2	16

87.50	
87.50	
	0.66

Question 5

	Yes	No	Total
Before	4	4	8
After	5	3	8
Total	9	7	16

P-
Value

0.38

Question 6

	Yes	No	Total
Before	2	6	8
After	5	3	8
Total	7	9	16

0.2

Question 7

	SD	D	N	A	SA	Total
Before	1		2	2	3	8
After			1	3	4	8
Total	1		3	5	7	16

Question 8

	SD	D	N	A	SA	Total
Before	1		1	2	4	8
After			1	2	5	8
Total	1		2	4	9	16

Question 9

	SD	D	N	A	SA	Total
Before	1			4	3	8
After			1	3	5	8
Total	1		1	7	7	16

SD = Strongly Disagree, D = Disagree, N = Neither agree or disagree, A = Agree, SA = Strongly Agree;

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