# A MULTI-CASE STUDY OF SCHOOL GARDENS IN SOUTHWEST MONTANA

by

Kimberly Ann Yates

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

Doctor of Education

in

Education

MONTANA STATE UNIVERSITY
Bozeman, Montana

May 2013

©COPYRIGHT

by

Kimberly Ann Yates

2013

All Rights Reserved

# APPROVAL

of a dissertation submitted by

Kimberly Ann Yates

This dissertation has been read by each member of the dissertation committee and has been found to be satisfactory regarding content, English usage, format, citation, bibliographic style, and consistency and is ready for submission to The Graduate School.

Dr. Michael Brody

Approved for the Department of Education

Dr. Jayne Downey

Approved for The Graduate School

Dr. Ronald W. Larsen

# STATEMENT OF PERMISSION TO USE

In presenting this dissertation in partial fulfillment of the requirements for a doctoral degree at Montana State University, I agree that the Library shall make it available to borrowers under rules of the Library. I further agree that copying of this dissertation is allowable only for scholarly purposes, consistent with "fair use" as prescribed in the U.S. Copyright Law. Requests for extensive copying or reproduction of this dissertation should be referred to ProQuest Information and Learning, 300 North Zeeb Road, Ann Arbor, Michigan 48106, to whom I have granted "the exclusive right to reproduce and distribute my dissertation in and from microform along with the non-exclusive right to reproduce and distribute my abstract in any format in whole or in part."

Kimberly Ann Yates

May 2013

# ACKNOWLEDGEMENTS

Writing this dissertation has been a journey for me. This process was one of the most emotional and challenging tasks I have taken on as a professional. Without the support of the wonderful people in my life and my thoughtful committee, I don't know how I could have done it.

To my husband for always believing in me, encouraging me, and pushing me to meet my full potential. To my children for enduring the frequent garden visits and being willing to pick up a pitchfork every now and then. Thank you for your support and patience through this process.

To Dr. Michael Brody, my committee chair, who always believed in me and endured my constant doubting. With his patience and kind words, I was able to find my way and see this study through to the end.

To my committee members, Dr. Art Bangert, Dr. Patricia Ingraham, Dr. Christine Rogers-Stanton, and Dr. Sarah Schmitt-Wilson, thank you for your continued support, advice, and feedback.

To my family, friends and colleagues, that always said I could do this. I appreciate all of your cheerleading along the way.

TABLE OF CONTENTS

1. INTRODUCTION ..... 1

Purpose of Research ..... 1
Research Questions ..... 3
Overview of the Topic ..... 4
The Greater Yellowstone Ecosystem ..... 6
Plant Hardiness Zone 4 ..... 9
Montana State Standards ..... 11
Nutrition Education ..... 13
Place-Based Education ..... 14
Summary ..... 15

2. LITERATURE REVIEW ..... 17

Introduction ..... 17
Learning Theory ..... 18
Meaningful Learning Theory ..... 19
Summary of Theoretical Framework ..... 23
Benefits of School Gardens ..... 25
Thinking (Cognitive Development) ..... 25
Feeling (Affective Development) ..... 30
Acting (Psychomotor Development) ..... 34
Best Practice ..... 40
Summary ..... 45

3. RESEARCH METHODOLOGY ..... 47

Introduction ..... 47
My Garden Journey ..... 49
Research Methods and Data Acquisition ..... 54
Relationship Building ..... 54
Sampling Procedures ..... 56
Data Collection ..... 57
Interview Description ..... 58
Interview Participants ..... 59
Video and Photographic Evidence ..... 60
Description of Personal Observations ..... 60
Description of Additional Materials Used as Data ..... 61
Case Studies: Sites and Participants ..... 62

TABLE OF CONTENTS – CONTINUED

Hyalite Elementary School, Bozeman, MT....64
Erin Jackson....65
Christine O'Shea....65
Mike Van Vuren....66
Sleeping Giant Middle School, Livingston, MT....66
Genna Williams....67
Dave Pettit....68
Lisa Rosberg....68
Mark Rehder....68
Ennis Schools K-8, Ennis, MT....69
Natasha Hegmann....70
Lacy Hubner....71
Brian Hilton....71
Janet Dochnahl....71
Data Analysis....72
Reading and Memoing....73
Describing....74
Classifying....75
Summary....75

4. DATA ANALYSIS....77

Introduction....77
Results....79
Bozeman, Montana....79
Hyalite Elementary....81
School Garden Description....82
Dominant Themes....84
How the Garden is Being Used....88
Challenges and Successes Association with the School Garden....90
Future Plans....93
Livingston, Montana....94
Sleeping Giant Middle School....94
School Garden Description....94
Dominant Themes....96
How the Garden is Being Used....99
Challenges and Successes Associated With the School Garden....101
Future Plans....104
Ennis, Montana....106
Ennis Schools K-8....107
School Garden Description....107

TABLE OF CONTENTS – CONTINUED

Dominant Themes ..... 111
How the Garden is Being Used ..... 114
Challenges and Successes Associated With the School Garden ..... 118
Future Plans ..... 119
Meaningful Learning Theory ..... 120
Motivations and Activities of Key Participants ..... 123
The Evolution of Three School Gardens ..... 128

5. CONCLUSION AND RECOMMENDATIONS ..... 131

The Purpose and Use of a School Garden ..... 132
Motivations of Key Participants ..... 136
Positive Outcomes and Evolution of Three School Garden ..... 139
Essential Elements: Recommendations For a Successful School Garden ..... 140
Supporters ..... 140
Planning ..... 141
Financial Considerations ..... 141
Maintenance ..... 142
Additional Resources ..... 143
Recommended Reading ..... 143
Summary ..... 144
Recommendations for Further Study ..... 147

REFERENCES ..... 149

APPENDICES ..... 155

APPENDIX A: VEE Analysis ..... 156
APPENDIX B: Summary Matrix of Garden-based Learning Research ..... 158
APPENDIX C: Possible School Garden Sites For Further Research ..... 162
APPENDIX D: Consent Form ..... 164
APPENDIX E: School Garden: Sample Interview Questions ..... 167
APPENDIX F: Interview and Site Visit Schedules ..... 170
APPENDIX G: Samples of Materials Used as Data ..... 173
APPENDIX H: Sample of Coding Process ..... 175
APPENDIX I: School Garden Checklist ..... 177

# LIST OF TABLES

Table Page

1. Climate Summary of Case Study Locations ..... 11

2. Bloom's Taxonomy: Psychomotor Domain ..... 35

3. Percentage of positive responses to factors that would encourage incorporating horticulture or gardening into the curriculum. ..... 41

4. Keys to Successful Gardens Identified by Carroll ..... 44

5. Supportive Body of Research Evidence ..... 46

6. Triangulation of the Data with Each Research Question ..... 58

7. Dominant Themes of Each Case Study ..... 79

8. Quotes indicating the impact of school gardens explained through the three principles of Meaningful Learning Theory ..... 124

9. Timeline of the SGMS garden ..... 129

10. Alignment of Research Results with Current Body of Literature ..... 146

# LIST OF FIGURES

Figure Page

1. The Greater Yellowstone Ecosystem ..... 7

2. Map of the GYE ..... 8

3. USDA Plant Hardiness Zone Map ..... 9

4. Concept Map of Theoretical Framework ..... 18

5. Concept Map of Novak's Theory of Meaningful Learning (1998) ..... 20

6. Characteristics of human learning showing variation on a continuum from very rote to highly meaningful ..... 22

7. Summary of Research Sample ..... 63

# LIST OF PHOTOS

Photo Page

1. Madison Farm to Fork Geothermal Greenhouses and Education Center .....10
2. Eagle Mount Garden in May of 2012 .....52
3. Eagle Mount Garden in July of 2012 .....53
4. Hyalite Elementary School Garden in September of 2012 .....64
5. Sleeping Giant Middle School Garden in September of 2012 .....67
6. Ennis Schools K-8 Garden Entrance .....69
7. Ennis Schools K-8 Garden in September of 2012 .....70
8. Aerial View of Bozeman, MT .....81
9. Raised Garden Beds Inlaid in Concrete at Hyalite Elementary .....83
10. Riparian Area and Natural Playground Pathway to the Garden .....88
11. Livingston, Montana: Yellowstone River near Livingston, MT .....94
12. Sleeping Giant Middle School Garden and Greenhouse .....95
13. Downtown Ennis, MT .....106
14. Ennis Schools K-8 Garden Diagram .....109
15. Ennis Schools K-8 Garden Gates and Flowerbed .....110
16. Three Sisters Garden and Student Artwork .....116
17. Third Grade Pizza Garden .....117
18. Mr. Pettit Teaching in the School Garden .....130

# DEFINITION OF TERMS

Terms used in the context of this dissertation are defined as follows:

**Case:** The case is the individual garden site.

**Case Site:** The case site refers to the geographic and ecological context of the garden.

**Case Study**: As defined by Sharan B. Merriam (2002), "a case study is less of a methodology, but rather a choice of "what is to be studied". The "what" is a bounded system, in which the entity being studied is defined by boundaries"(p.178). In this research the case studies are three school gardens along with the respective ecological and social contexts.

**Connectedness**: A feeling of belonging to something bigger than oneself. This can include feeling connected to a community, school, classroom, school garden, or nature.

**Community**: This may describe the local area in which a person lives, or a smaller faction, such as a school garden, community garden, school, classroom, or small group of students working together.

**Elements**: Elements are specific parts, processes, and resources that are used to describe a successful garden and its development.

**Environmental Awareness**: Having an understanding of the human impact on the natural environment and how change may occur as a result of human interaction.

**Learning**: Learning is defined as a permanent change in behavior through practice and experience. For the context of this study learning is measured in three ways: Thinking (cognitive), Feeling (affective), and Acting (psychomotor) development.

DEFINITION OF TERMS – CONTINUED

**Meaningful Learning Theory**: Defined by Joseph Novak (1998) as an enhanced meaning of an experience that occurs when all three forms of learning are engaged: *Thinking*: the acquisition of knowledge (cognitive learning); *Feeling*: change in emotions or feelings (affective learning); *Acting*: a gain in physical or motor actions or performance (psychomotor). The three forms of learning interact and result in meaningful learning. Thinking, feeling, and acting are also commonly described as cognitive, affective, and psychomotor development.

**Natural Playground**: A natural playground is designed using natural materials such as boulders, logs, tree stumps, and native plants in exchange for prefabricated play equipment. The intention of the design is to allow children an opportunity to explore, use their imagination, and experience the smells, textures, and wonder of nature through play.

**Nature**: In the context of this study, nature is used to describe the natural environment, including trees, animals, dirt, insects, plants, etc.

**Place-based Education**: This is a pedagogy that describes a way of teaching and learning using a local context. This approach is used to help students understand their surroundings, such as climate, agriculture, landscape, and commerce, and developing a deeper sense of connection to that community (Smith & Sobel, 2010).

**School Garden**: For this study, a school garden is defined as a garden that grows edible plants, such as fruits, vegetables, and herbs. The garden is located on school property and is used by teachers, volunteers, other school employees and students during regular school hours and/or during summer and afterschool programs.

DEFINITION OF TERMS – CONTINUED

**Themes**: Themes refers to the broad categories of results based on the analysis of each case study site.

**Types of Experiences**: *Direct Experiences*: contact with natural settings in an unplanned, spontaneous way, such as children playing in the woods, park, or meadow; *Indirect Experiences*: contact with nature that has been contrived by human activity, such as a nature center, aquarium, or garden; *Vicarious Experiences*: the absence of contact with the natural environment with a substitution of images or symbols of nature through the use of television, computers, and books (Kahn & Kellert, 2002).

# ABSTRACT

Many children today spend little time outdoors exploring the natural world and a great deal of time inside viewing the television or playing video games. This new condition of childhood has many negative ramifications, such as poor social development, childhood obesity, and a lack of feeling connected to the environment. One instructional tool being used by some schools to address these rising concerns is a school garden. School gardens can provide an opportunity for students to experience learning in a real-world application, outside of the classroom walls. This qualitative multi-case study explores three school gardens in Southwest Montana and tells each of their unique stories. Through the process of participant observation, interviews, and the collection of multiple data sources, a thorough description is given of the history behind the gardens, how they have impacted the teachers and students, what challenges they have faced, and the common characteristics found in a successful school garden program. During the data analysis process, themes for each case study site were revealed. The results of this study found that each school garden was unique in character and purpose and that a number of dedicated garden supporters are essential to the success of a garden program. In conclusion, suggestions and resources were provided for practitioners interested in pursuing a garden program.

# CHAPTER 1

# INTRODUCTION

## Purpose of Research

Providing children the opportunity to connect with nature has long been a subject of interest for me. With my own children, I have observed a difference in behavior and overall mood when they spend time outdoors. My own interest and experience with the benefits of being outdoors has led me to investigate the history and purpose of school gardens in my local area, and in other cities in Southwest Montana.

This dissertation is focused on how a school garden can be used as a means to help connect children to nature. School gardens can have many purposes, but ultimately, a school garden is a tool for getting children outside and providing them with an opportunity to explore the natural world. School gardens around the United States, and even the world, have been utilized to address many important issues, such as climate, food systems, and nutrition (Carroll, 2003; Cohen, n.d.; Gaylie, 2011). Some of the benefits identified by researchers include healthier eating habits, increased environmental awareness, enhanced development of social skills, and improved academic performance (Blair, 2009). A great deal of research has been done on the effects of gardening in the school setting; however, much of this research is focused on urban communities in more moderate climates. Further research is necessary to gain an understanding of the unique challenges and benefits there may be for school gardens in a harsher, winter climate, with

primarily rural populations. The garden sites explored in this study are located in the Northern Rocky Mountains of Southwest Montana in the United States.

In recent years, many schools in Southwest Montana have developed gardens. Through preliminary investigations, and a pilot study conducted in the spring of 2012, many school garden sites across the state of Montana were identified. Information on the schools that participate in garden programs is available through The National Farm to School Network and the National Center for Appropriate Technology (NCAT). These agencies also provide information and support for teachers, administrators, farmers, and community members regarding local food systems and nutrition education (The National Center for Appropriate Technology, n.d.; National Farm to School Network, n.d.).

I began networking with people involved in school gardens during a pilot study focused on one site in Bozeman, MT. This preliminary study was conducted to gather information on the current issues and growing trend of school gardens in this area. In order to gain a better understanding of when school garden programs first emerged in Montana schools, and how they are utilized to enhance student learning, this study will include three case studies of school gardens, one from each of three different Montana cities located in the Greater Yellowstone Ecosystem. Each case study includes information about how and when the school garden was established, providing an in-depth history of the development of each garden site.

In order to determine the ways in which each garden is being used to both educate school children and connect them to the natural environment, Meaningful Learning Theory will be the conceptual lens from which the garden-based programs will be

evaluated. Meaningful Learning Theory includes three areas of development that interact in order for meaningful learning to occur: thinking, feeling, and acting (Novak, 1998). The collaborative works of Benjamin Bloom and a committee of college examiners described these three domains as cognitive, affective, and psychomotor (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). In chapter two, the literature review will include a more detailed description of each domain and its relationship to meaningful learning.

Chapter Three will detail the qualitative analysis of materials including field notes, observations, and interviews utilized to gather data in order to describe the garden sites in this study. The results of the data analysis of all three case studies will be discussed in Chapter Four. Upon completion of the analysis, the impact on students, teachers, and the community associated with having a garden program will be discussed in the context of the three facets of Meaningful Learning Theory; Thinking, Feeling, and Acting. The results will be valuable to practitioners in education, administrators, community organizations, and others interested in the pursuit of garden-based learning programs.

## Research Questions

1. How do the three facets of Meaningful Learning Theory—Thinking, Feeling, and Acting—help explain school gardens at three schools in Southwest Montana?

2. What are motivations and activities of key participants (teachers, government organizations, school principals, and community members) related to the success of the school gardens at the three study sites?
3. From the perspective of the adults involved at each garden site, how have the three school gardens evolved over time?

## Overview of the Topic

Connecting children with the natural world around them is a necessary and important part of healthy development (Louv, 2008). According to Kahn and Kellert (2002), connecting children to nature through direct, indirect, and even vicarious experiences can have a positive impact on cognitive development. Today, more than ever, there is a need to create opportunities for children to experience nature (Louv, R., 2008). In this era, many children spend very little time outside exploring, a growing concern that Richard Louv addresses in his book *Last Child in the Woods: Saving our Children from Nature Deficit Disorder* (2005). He articulates the need for, and benefits of, children spending time outside. Endorsing research of recent years supports the fact that direct exposure to nature is a necessary and essential part of the physical and emotional health of both children and adults (Blair, 2009; Kahn & Kellert, 2002; R. Kaplan & S. Kaplan, 1990). This increased awareness of the importance of connecting children with nature has led to government support at both the federal and local level through the enactment of laws, funding of school nutrition programs, and legislation such as the No Child Left Inside Act of 2009. This is a bill that was brought before Congress

to make changes at the national level, requiring schools to teach environmental literacy to students in grades K-12 (No Child Left Inside Act of, 2009). At the local level, in Montana, former Governor Brian Schweitzer and his wife Nancy promoted programs to increase the consumption of fruits and vegetables among school children and taught about the importance of agriculture in our community. As a result of this growing concern to increase the amount of time children spend outdoors and away from technology, parents and educators have supported indirect experiences that provide children with opportunities for connections to nature. Some of these indirect experiences include natural playgrounds, outdoor classrooms, and school gardens. Two elementary schools in Bozeman have recently installed natural play areas and have outdoor classroom space to provide additional time during the regular school day for exposure to the natural environment. These schools also have garden programs and are working continually toward providing outdoor experiences for their students. Richard Louv once said, "When we take nature away from people we take away their ability to be full human beings."

School gardens have long been recognized as having both social and academic benefits to students (Gaylie, 2011). Research often focuses on benefits such as improved academic success, healthier eating habits, and improved social skills (Blair, 2009; Klemmer, Waliczek, & Zajicek, 2005). There is also much evidence of the need for teaching children sustainable food practices and environmental stewardship, especially in urban areas (Gaylie, 2011). The current literature, however, is limited on research regarding garden-based learning programs specific to southwest Montana, as many of the

existing studies on school gardens focus on urban areas (Gaylie, 2009). California is a prime example of a state with a number of urban areas where school gardens have been the subject of research. In contrast, Montana has an extremely low population density, with only 6.65 people per square mile compared to 235.68 people per square mile in California (World Atlas Travel, 2008). In addition to consisting of mainly rural communities, southwest Montana is also beset with the challenges of a harsh climate and a short growing season.

## The Greater Yellowstone Ecosystem

The three school gardens being examined in this study are located in the Greater Yellowstone ecosystem (GYE). The GYE is one of the largest intact ecosystems in the United States, consisting of over 6 million hectares and extending into the three states of Idaho, Montana, and Wyoming (Figure 1) (Reading & Kellert, 1994). This ecosystem is defined by distinct wildlife, vegetation, and terrain, including high-ridged mountains and deep valleys. The GYE also consists of several national forests and two national parks: Yellowstone National Park and Grand Teton National Park (Figure 2). The unique landscape includes dominant features such as the Yellowstone Plateau, a reminder of the volcanic history of the area, which reaches an altitude of 2,438 meters in elevation (Stanionis, 2003). Surrounding this central landscape feature are the Wind River, Teton, Absaroka, Washburn, Beartooth, Gros Ventre, Centennial, Madison, Gallatin, and Bridger mountain ranges (Stanionis, 2003). Due to its location in the GYE, this region of Montana is characterized by a complex climate fitting to the highly variable topography,

as elevations range from 1,800 to 12,850 feet above sea level, the height of these being at the summit of Granite Peak near Yellowstone Park (Caprio & Fames, n.d.).




Figure 1. The Greater Yellowstone Ecosystem. Inset Map by Aaron Jones, Montana State University. Greater Yellowstone Ecosystem Map by Conservation Science, Inc. (Stanionis, C.C., 2003, p.22)




Figure 2. Map of the GYE (Greater Yellowstone Coalition, n.d.)

Plant Hardiness Zone

The United States Department of Agriculture divides the United States into several plant hardiness zones (Figure 3). The zone classifications are based on the average low winter temperature, and the map is then divided into 10-degree Fahrenheit zones (USDA, n.d.). The plant hardiness zone map is used to inform gardeners and other growers of which plants will do well in their local climate. The mountainous topography and high elevations of Montana and the Greater Yellowstone region correspond to a cold winter climate and shorter growing season, which classifies this region as a Zone 4. The three case studies being examined are located in Zone 4b, which has an average winter low temperature of between 20 to 25 degrees below zero (Fahrenheit). With average lows in the negative 20's, growing outside in the winter is not an option for Southwest Montana schools.

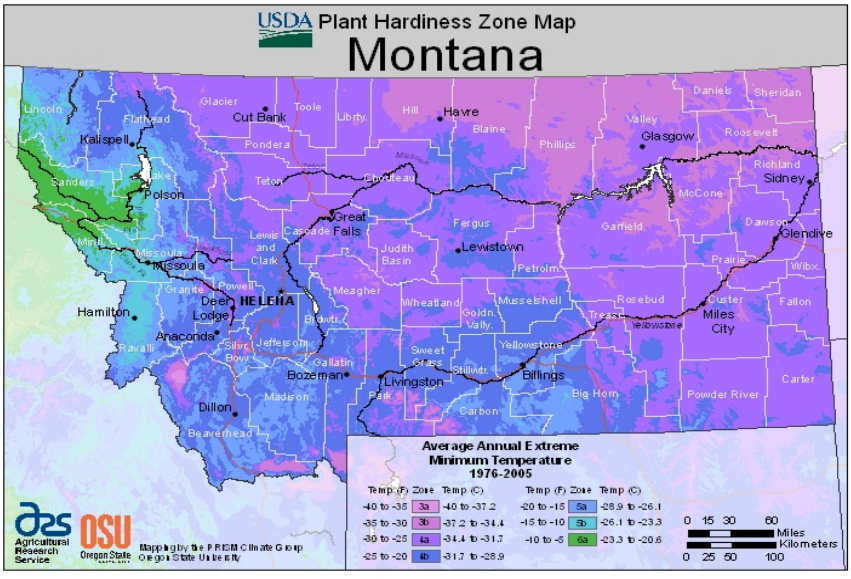



Figure 3. USDA Plant Hardiness Zone Map

Despite the low winter temperatures, agriculture is the top industry in Montana, generating $2.6 billion in income on 29,400 farms and ranches (Montana Department of Agriculture, 2011). In addition to the state's staple crops of wheat and beef, diversification is becoming more common, with farmers now growing more peas, lentils, and honey. Some communities are going to extremes to support and expand the products that are available in the region. Small farmers and local garden enthusiasts have been able to extend the growing season with the use of hydroponics, hoop houses, and geothermal greenhouses. One example of how this is being used to support the local food system is evidenced in Madison County. There, a local group of volunteers worked together to build two geothermal greenhouses. One of the greenhouses is dedicated to production and provides fresh produce to the local farmers market. Using this greenhouse exclusively for production helps provide the community with more consistent access to fresh produce, even during the colder months when some items would not be available. The second building is used as an education center for the local community, providing educational programs for both youth and adults (Madison Farm to Fork, n.d.).



Photo 1. Madison Farm to Fork Geothermal Greenhouses and Education Center

Farmers and others in the agricultural industry are not limited by the constraints of the academic calendar. However, for the three schools involved in this study, the lack of alignment between the academic year and the growing season can be a challenge. The typical school year for these three Montana schools begins in late August. As you can see in Table 1, this leaves precious little time to plant and harvest with students in the fall, as there are only about three to four weeks until the first frost. Planting in the early spring can be problematic, as well, since the last frost can come as late as June 2; so students may not get a chance to plant at all. The school year typically ends during the first or second week of June, which means the majority of the growing season for Zone 4b is during the summer break, when children are out of school.

Table 1. Climate Summary of Case Study Locations

| Montana City | Last Frost | First Frost | Growing Season (days) |
|---|---|---|---|
| Bozeman | May 24 | Sept. 16 | 115 |
| Livingston | May 17 | Sept. 21 | 127 |
| Ennis | June 2 | Sept. 11 | 101 |

Montana State Standards

Despite the challenges to gardening related to climate and region, a school garden is still regarded by teachers and administrators as a great tool for teaching the Montana State Standards. During the numerous site visits and interactions that I had with the participants of this study, it was made clear that regardless of the challenges, the gardens remained an important tool for teaching and learning. The former Governor of Montana and his wife promoted their passion for math and science with the Math and Science

Initiative, which encourages students to discover the many wonders of science and explore the diverse features of the state of Montana (Governor Schweitzer, 2010). As part of this initiative, former First Lady Schweitzer developed the program Nancy's Garden, supporting and promoting school gardens by making teaching materials and grow boxes available to all fourth grade classrooms in the state. In addition to promoting gardening, this program aims to encourage healthy eating and increase interest in future careers in agriculture within the state (Governor Schweitzer, 2010). First Lady Schweitzer shares her enthusiasm with the following statements: "Science is exciting and full of discovery. I want to spark an interest in science when students are young…" and "Let's explore plants, promote healthy eating, and connect kids to the outdoors!" (http://www.mathscience.mt.gov)

With the use of "Nancy's Garden," teachers can help develop the skills of their students through hands-on experiences while addressing important science standards. An overview of the National Science Education Standards states, "everyone deserves to share in the excitement and personal fulfillment that can come from understanding and learning about the natural world" (National Academic Press, n.d.). Through the use of indirect experiences, such as school gardens, students are able to experience science first hand. Both the National Science Education Standards and the Montana State Standards put heavy emphasis on the importance of using inquiry in science learning. Montana's Office of Public Instruction (OPI) pronounces, "Science is an inquiry process used to investigate natural phenomena, resulting in the formation of theories verified by directed observations" (Montana OPI, C&A, 2012). The Montana OPI also states that the use of

inquiry validates different ways of gathering, synthesizing, and communicating knowledge. Teachers are encouraged to use a variety of methods, providing students with both indirect and vicarious experiences, for optimal learning to occur.

Nutrition Education

The use of school gardens is not limited to science curriculum; many other educational goals can be met as well. The state of Montana offers school nutrition programs designed to teach children the importance of healthy eating habits, increase consumption of fruits and vegetables, and to expand on the varieties of fruits and vegetables children experience (Montana OPI, School Nutrition, 2012). One way for students to gain these increased experiences with food is to grow edible items in a garden on school grounds. This will not only expand their experience with the food they are consuming, it can also impact their affective development by affording students the opportunity to work in cooperation with their peers and gain understanding of the delicate balance of nature that is required to successfully grow plants.

When it comes to food, nutrition, health, and education, the topic of growing food and understanding where food comes from is becoming increasingly important, and the organization known as FoodCorps has played a role in making nutrition education a successful endeavor in many communities across the country. FoodCorps is a grantee of AmeriCorps, "a federal initiative that engages people of all ages and backgrounds in strengthening U.S. communities through service," with their primary focus being on food and nutrition (FoodCorps, 2011a). With 80 FoodCorps Service Members and 12 FoodCorps Fellows, the organization is able to service over 60 different sites in 12 states

(FoodCorps, 2011a), with Service Members typically placed in areas that are under-resourced. Montana has 10 Service Members located across the state working in rural communities, Indian reservations, and other communities with a struggling economic profile. The mission and vision of FoodCorps is to promote a healthy future for today's children who are susceptible to obesity and other diet-related health issues.

> *The FoodCorps Mission*:
> Through the hands and minds of emerging leaders, FoodCorps strives to give all youth an enduring relationship with healthy food.
>
> *The FoodCorps Vision*:
> We envision a nation of well-nourished children: children who know what healthy food is, how it grows, and where it comes from, and who have access to it every day. These children, having grown up in a healthy food environment, will learn better, live longer, and liberate their generation from diet-related disease. (FoodCorps, 2011a)

## Place-Based Education

Agriculture has a rich heritage in the state of Montana, yet over the last 60 years the state has seen a decline in local food procurement from 70 percent in 1950 to only 10 percent in today's market (FoodCorps, 2011a). Most of what is being grown in Montana is being shipped to other states, and this has created a disconnect between the producers and the consumers. Children growing up in rural, agricultural communities often do not eat the food that is being produced locally. Place-based education can be used to help close this gap. With the use of a school garden, local farm, or greenhouse, school-aged children can begin to reconnect with their community.

> Place-based education is the process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science, and other subjects across the curriculum. Emphasizing hands-on, real-world learning experiences, this

> approach to education increases academic achievement, helps students develop stronger ties to their community, enhances students' appreciation for the natural world, and creates a heightened commitment to serving as active, contributing citizens. Community vitality and environmental quality are improved through the active engagement of local citizens, community organizations, and environmental resources in the life of the school. (*Place-Based Education*, David Sobel, 2005)

Place-based education not only connects students to their local community, it is accomplished through the use of hands-on, real-world, interdisciplinary methods. In her math and science initiative, former Montana First Lady Nancy Schweitzer addressed the fact that it is also important to get students excited about careers in agriculture. The future of the state's food security is dependent on the continued education of children about local food systems, how to grow food, and from where their food comes.

## Summary

This dissertation study intends to be informative and helpful to educators, administrators, and community members who have a passion for connecting children to the natural environment, their community, and their food. In doing so, it is important to discuss the many factors that may potentially influence whether a school chooses to implement a garden program. Montana has a harsh winter climate, diverse topography, and a sparsely populated landmass. With these characteristics defining the region, there are challenges associated with implementing and sustaining a successful school garden program. Through the thorough examination of three case studies in southwest Montana, my goal is to provide practical solutions and helpful information for future success. A school garden can have many uses: teaching academic standards such as art, literature,

writing, and health enhancement; connecting children to their community; teaching children about food systems and local agriculture; and providing meaningful learning experiences. Indirect experiences in a school garden can incorporate thinking, feeling, and acting which lead to *meaningful learning*, and therefore, have a lasting impact on students.

# CHAPTER 2

# LITERATURE REVIEW

## Introduction

This chapter contains supporting evidence of the benefits of school gardens and garden-based learning. Many learning theories may be applicable in providing foundational support of the benefits to cognitive, affective, and psychomotor development when using a school garden as an instructional tool. However, for this study Meaningful Learning Theory will be applied as the supporting theory for learning in a garden. In addition to theory, researchers from various fields provide evidence of a wide spectrum of benefits, including but not limited to health and nutrition, improved academic performance, environmental stewardship, science education, and developing a sense of place. The review of the literature is organized as follows: an investigation of learning theories that drives the use of school gardens as an instructional tool; an examination of a variety of uses and benefits associated with garden-based learning, such as science curriculum, social skills, place-based education, and nutrition, represented in the three categories of thinking, feeling, and acting; and best practices in garden-based education. A variety of resources were used to gain a breadth of knowledge on learning theory and the benefits and uses of school gardens. Peer reviewed journal articles, Master's Theses, Dissertation studies, textbooks, online publications, magazines, reference books, and blog postings were all considered and utilized to inform the body of

literature supporting this study. Figure 4 is a concept map provided to help illustrate the connections between learning theory and garden-based education.

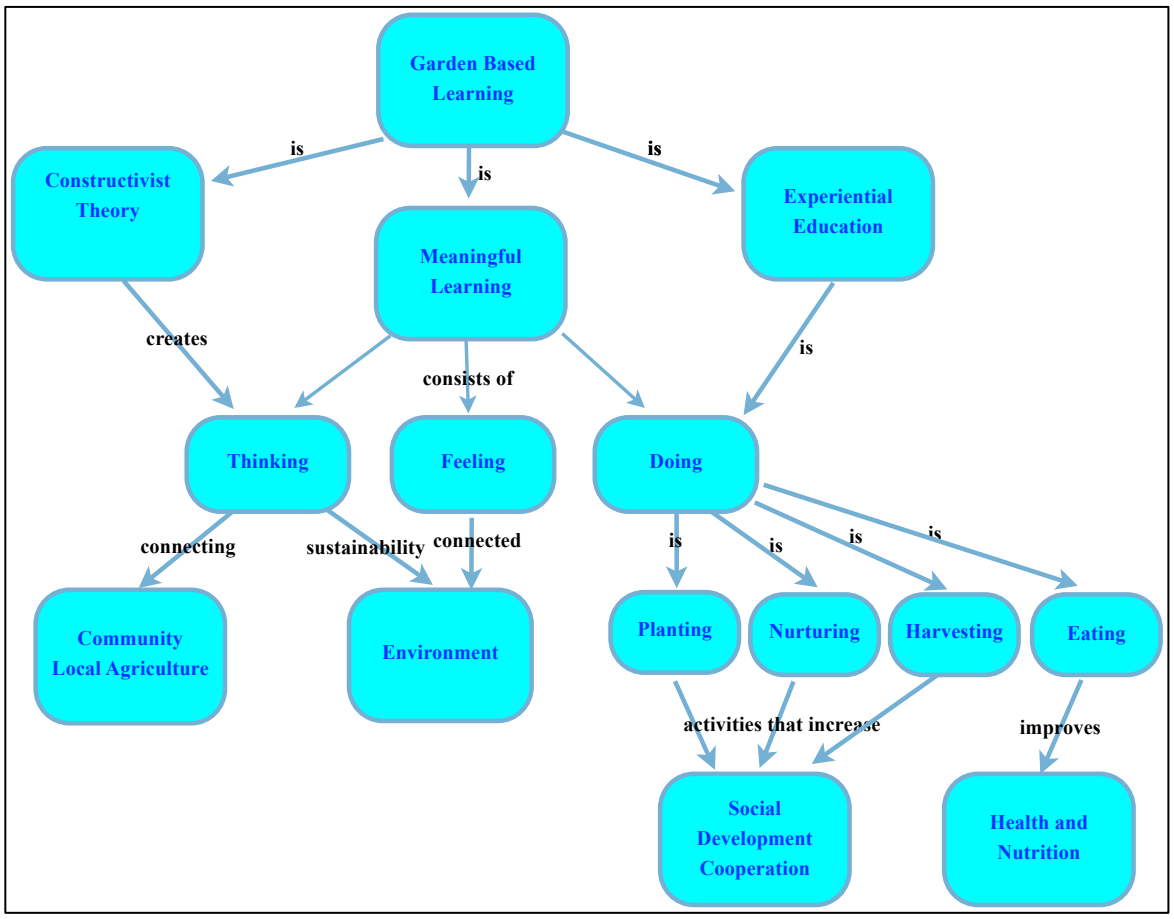



Figure 4. Concept Map of Theoretical Framework

## Learning Theory

What is learning? Learning is an enduring change in behavior, or in the capacity to behave in a given fashion, which results from practice or other forms of experience (Schunk, 2008). Schunk's (2008) definition can be further described as consisting of three main criteria: first, a change in behavior occurs; second, that change in behavior is

not temporary but endures over time; and third, learning occurs through repeated practice or experience.

If learning is defined as a change in the way we behave through practice and experience, it follows that an effective method for teaching would be making the experience hands-on and personal. When students learn about a garden in a textbook the experience is vicarious or symbolic; in other words, the students are reading descriptions of a garden or being shown garden-related images (Kahn & Kellert, 2002). In contrast, when children learn about a garden by experiencing it directly, they physically interact with the feel of the dirt, the warmth of the sun, and the smell of the air.

Direct contact with natural environments is important for cognitive development in young children, and social development in adolescence (Kahn & Kellert, 2002). Some of the positive effects of direct experiences in a school garden include improved interactions with peers, engaging all senses, learning about plants, communication, natural systems, cooperation, and cause-and-effect relationships (Carroll, 2003; Louv, 2008; Sobel 2005). The theoretical foundation for studying school gardens can be summarized into three main, often overlapping, theories: Meaningful Learning Theory, Constructivism, and Experiential Education.

## Meaningful Learning Theory

Novak's development of Meaningful Learning Theory was influenced by the work of David Ausubel and his book *Educational Psychology: A Cognitive View* (1977). Novak (1977) provides an overview of Ausubel's theory: "The most important single factor influencing learning is what the learner already knows. Ascertain this and teach

him accordingly" (p. 24). Novak further describes the work of Ausubel and his central idea, *meaningful learning*: "To Ausubel, meaningful learning is a process in which new information is related to an existing relevant aspect of an individual's knowledge structure" (p.74). When we discuss learning, it is important to note that Novak is interested in providing guidance for the ways that human beings learn. Figure 5 is a concept map that illustrates the underlying principal of Novak's (1998) theory of education, "Human beings do three things: they think, feel, and act." (p. 12)

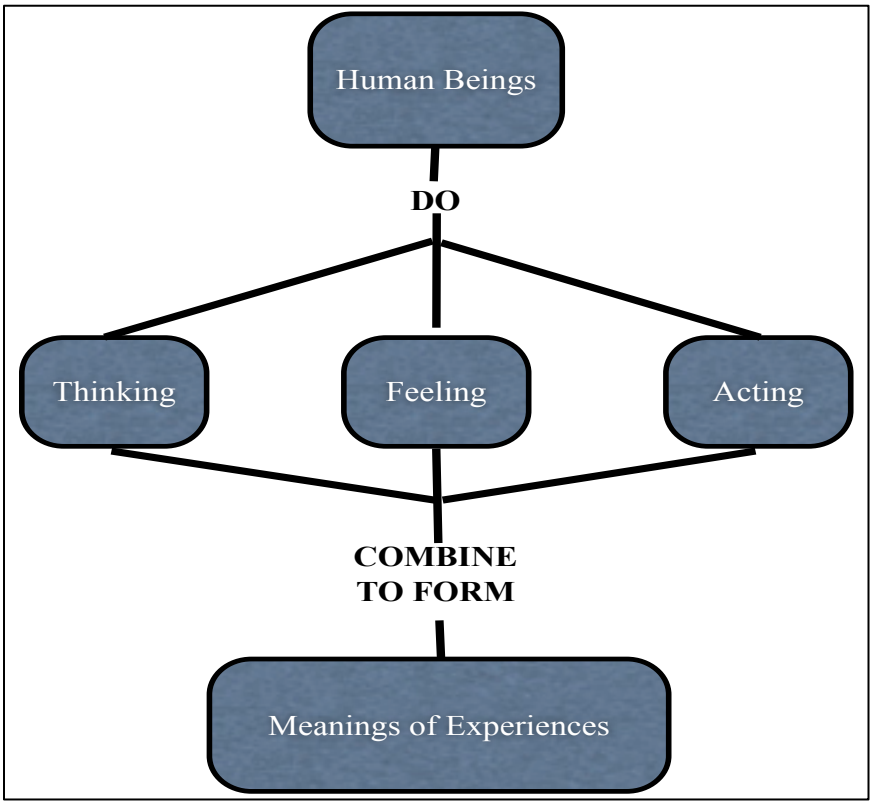



Figure 5. Concept Map of Novak's Theory of Meaningful Learning (1998)

According to Novak (1998), making or creating your own meaning involves three aspects: thinking, feeling, and acting. Building on this principle, Novak developed "A

Theory of Education," which states, "Meaningful learning underlies the constructive integration of thinking, feeling, and acting, leading to empowerment for commitment and responsibility" (p. 15).

Preceding Novak's theory of Meaningful Learning, Benjamin Bloom (1956) defined thinking, feeling, and, acting as cognitive, affective, and psychomotor development. In the context of Meaningful Learning Theory and this dissertation study, the term *thinking* is in reference to cognitive development or the acquisition of knowledge, while *feeling* is referring to the affective domain or the emotional responses elicited by an event, and *acting* refers to psychomotor skills or the physical act of engaging in a task.

It is also important to note that Novak believes learning occurs on a continuum from rote learning to meaningful learning (See Figure 6). As with Ausubel's theory, Novak (1998) believes that meaningful learning occurs, "when the learner chooses to relate new information to ideas the learner already knows" (p.19). Based on this continuum model, many different methods of teaching can be placed somewhere between rote learning and meaningful learning. Engaging in hands-on gardening activities, with classmates, while learning about soils, is an example of a teaching modality that would be categorized by the meaningful learning end of the continuum and lead to creative production. On the other end of the continuum lies rote learning, where the learner only memorizes new information and does not relate it to any prior knowledge or experience (Novak, 1998). There is indeed a place for such teaching approaches as rote learning, for example when memorizing math facts or a poem, but Novak (1998) holds that the real

value of rote learning is only realized when the learner begins to understand the meaning of what they have memorized. If you consider a poem for example, you can memorize the words and recite them for a given purpose, such as a class assignment, but these words will only stay with you long term if you begin to understand the message the poet was trying to convey with the use of those particular words.

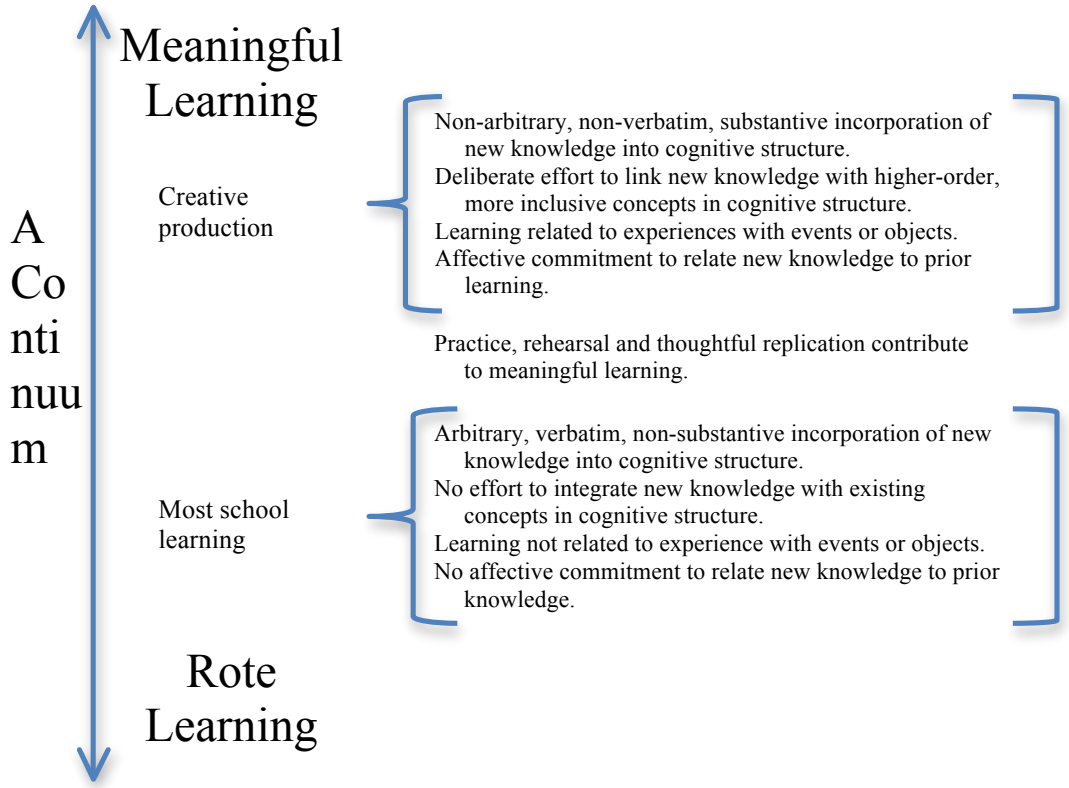



Figure 6. Characteristics of human learning showing variation on a continuum from very rote to highly meaningful. Only high levels of meaningful learning lead to creative production. (Novak, 1998, p. 20)

Meaningful Learning Theory shares common views with Constructivism and Experiential Education Theory in that students create or make their own knowledge based on their experiences (Kolb, 1984; Novak, 1998; Schunk, 2008). Novak (1998) states that,

"the central purpose of education is to empower learners to take charge of their own meaning making." This is the claim of Experiential Education Theory as well, which defines learning as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience" (Kolb, 1984, p.41). This same belief is also expressed by the primary philosophy driving Constructivism. Largely based on the theories of Piaget and Vygotsky, Constructivism contends that individuals construct what they learn and understand (Schunk, 2008, p. 235). When such theories are integrated into the curriculum, teachers use materials that allow the students to be actively involved, in other words, they are experiencing the content (Schunk, 2008, p. 241).

Summary of Theoretical Framework

Throughout the literature, research studies, as well as other publications provide evidence of how a school garden can be instrumental in helping students to develop meaning out of their experiences. Many of the learning experiences taking place in a school garden can be categorized as demonstrating qualities of one or all of the following learning theories: Meaningful Learning, Experiential Learning, or Constructivism. In many cases these terms can be used synonymously.

A program evaluation summarizing the benefits of school gardens provides examples of Meaningful Learning Theory, illustrated by student growth in the areas of cognition, improved social interactions, and hands-on experience (Blair, 2009). In a discussion of how gardens are used to teach place-based education, the author writes, "Along with English sparrows, starlings, quack grass, and bees, gardening provides

another kind of lesson, one about human interactions with the natural world" (Blair, 2009 p. 18). Blair (2009) also includes a description from Demas (1979), "a garden is an environment in miniature, and to be successful a gardener must work in sympathy with nature." (p. 17)

In another school garden, educators used experiential learning to improve science education by integrating cross-curricular activities including science, math, writing, and social studies (Blair, 2009). In this school program, students planted flowers from seed, conducted census counts of butterfly and caterpillar populations, tagged migrating monarchs, and experienced cultural diversity through their interaction with students from another country (Blair, 2009).

The assortment of school gardens evaluated by Blair (2009), demonstrates qualities of the theoretical framework for this study. Students are creating meaning through their experience in the garden by improving their gardening and science skills, which is an example of *acting* or psychomotor development. Blair also discussed evidence of affective development, or the *feelings* of students participating in garden programs, through the increased sympathy or positive feelings about the natural environment and social interactions with children from another culture. The *thinking* or cognitive development is evidenced in the content-based activities that took place: census counts, tracking migration, and cultural awareness.

Blair's (2009) program evaluation is just one example of research on school gardens that found evidence of myriad benefits for the students who participated.

Subsequent sections of this chapter will discuss in greater detail the benefits of school gardens and how they apply the principles of Meaningful Learning Theory.

## Benefits of School Gardens

Many benefits to school gardens are evident in the literature; however, the focus areas of the studies and publications are quite varied. To better understand how Meaningful Learning Theory is incorporated into school gardens, the literature that was reviewed for this dissertation is organized under the same categories discussed in the theoretical framework: *thinking* (cognitive development), *feeling* (affective development), and *acting* (psychomotor). Many of the articles discussed contain elements that overlap and fall into more than one learning domain. To provide the best supporting evidence of uses and successful learning outcomes in varied school garden programs, each piece of literature is placed under the category that best represents the developmental domain targeted by the activities conducted in or around the school garden.

### Thinking (Cognitive Development)

As discussed previously, learning is defined as a change in behavior that is permanent and persists over time. When considering learning in the context of brain development, learning can be defined as a process of building neural networks (Wolfe, 2010). The networks that result in learning can be achieved at three different levels, through concrete experience, symbolic, and abstract learning (Wolfe, 2010). Wolfe provides the following example of how meaningful learning is achieved through concrete

or direct experiences: imagine a child out for a walk with a parent when they encounter a furry, four-legged creature the child has never seen before. The parent tells the child this is an animal and it is called a dog. Because the dog is friendly and the parent allows the child to touch and pet the dog, this experience will be stored in the brain as a physiological connection between neurons (Wolfe, 2010). During future encounters with a dog, the neurological connection will be strengthened and the child will learn that this animal is a dog. As more animals are introduced to the child, the connections expand to include multiple animals in a larger network. Wolfe (2010) states that, "without a concrete experience, a representation or symbol may have little meaning no matter how much someone explains it to you." This is consistent with Ausubel and Novak's theory of learning, which believes that learners must relate new information to ideas and experiences they already know in order for meaningful learning to occur.

Another method of learning is through symbolic representations. This method can be effective; however, without an initial concrete experience, the learning is not as meaningful. Wolfe (2010) explains how looking at pictures of exotic animals can result in a child learning the various names, but the information is not as meaningful as it could be with a prior direct experience. Here is how the process of symbolic representation works: When a child learns the names of animals while visiting the zoo, they are experiencing the entire environment: sound, sight, smell, and touch. When the child later sees a photo of an animal from the zoo, the brain recalls all of the sensory information from that experience, which makes that connection stronger and more meaningful. In the context of school gardens, describing vegetables, or categorizing them by looking at photos, has less

impact to the learner than experiencing vegetables first hand by planting the seeds, nurturing the plants, harvesting, and finally tasting the product.

Abstract is the third level of learning and is often dependent on the developmental age of the child. With a strong neural network of concrete experiences, abstract learning is possible through the use of description and explanation (Wolfe, 2010). For example, if your animal network is established as a child through concrete experiences, you are then later able to draw on that knowledge and apply it to an abstract learning experience, such as picturing mystical creatures in your mind as you read a chapter from a book.

When discussing cognitive development as it relates to school gardens, the focus is not typically on a traditional classroom setting with direct instruction; instead the school garden can be thought of as a learning laboratory or an extension of the classroom in which students are able to experience the natural world with all their senses. Studies investigating school gardens and neuroscience have shown evidence of benefits to spending time in the natural world (Alexander, North, & Hendren, 1995; Kwak-Hefferan, 2012). Kwak-Hefferan's (2012) study examined the effect of long-term exposure to the natural environment. The researchers hypothesized that exposure to nature causes a significant and measurable change in the brain, allowing you to think more clearly, focus more acutely, and perform at your maximum cognitive ability (Kwak-Hefferan, 2012). Data was collected with the use of a classic cognitive, Remote Associates Test and an Operation Span test. The results of the Remote Associates Test showed that after four days in the wilderness, participants of this study increased their scores by 45 percent

(Kwak-Hefferan, 2012). This study provided important evidence on the impact of exposure to nature and improved capacity for learning.

Further review of existing literature revealed that school gardens are being used for many different academic purposes. Emily Ozer conducted a review of garden literature in 2007, in part to identify the impact of school garden curricula on students and school functioning. In her review, she identifies many different subject areas in which students are receiving instruction in a garden setting.

A survey conducted in California concluded that most school gardens in the state were being utilized to teach science, environmental studies, nutrition, language arts, and math (Ozer, 2007). Some school programs included weekly cooking classes for students in addition to a weekly garden class. Although Ozer (2007) was not able to acquire a large number of research studies with empirical data on the benefits of gardens, there were a limited number of studies for her review.

On the subject of nutrition education, a quasi-experimental study showed an improvement in fourth grader's knowledge and preference towards vegetables in schools with a garden-enhanced nutrition education curriculum (Ozer, 2007). The goal of many nutrition education programs is to increase knowledge of the health benefits associated with making more nutritious food choices. The experience students have in garden programs, where they take part in growing, harvesting, and eating the produce can have a lasting effect on the dietary choices they make in the future (Cohen, n.d.).

A research brief from Life Labs Science Program shared similar results, stating that innovative education methods, such as hands-on gardening activities, have yielded

positive results in increasing children's long-term knowledge of and preference for fruits and vegetables (Cohen, n.d.). A teacher from Sausalito, California shares her experience:

> My students clearly have an increased knowledge of where their food comes from and how it is grown. They now have the ability to grow some of the food at their own homes. The garden-based nutrition program has greatly increased their knowledge and desire to eat healthy food and to be physically active every day. (Cohen, n.d. p. 1)

The consensus among researchers is that much evidence of the benefits of school gardens is anecdotal and few empirical studies have been conducted (Ozer, n.d.; Morgan, Hamilton, Bentley, & Myrie, 2010). This next study is an example of one of the scarce empirical research studies that has taken place in order to provide statistically significant data on the impact of the use of school gardens on science achievement scores (Klemmer, Waliczek, & Zajicek, 2005). The researchers used an experimental design with both experimental and control groups, each group consisting of students in grades three through five, from seven different schools. The experimental groups received garden curriculum and teacher training designed specifically for this study, while the control groups taught similar science-based lessons using their traditional teaching methods in the classroom. At the end of the study, findings indicated, "that students who participated in hands-on gardening activities had higher science achievement scores versus those who did not" (Klemmer et al., 2005 p. 450). The researchers concluded that these results were in accord with research supporting the belief that students' level of knowledge increases with the use of hands-on and experiential activities (Klemmer et al., 2005).

Feeling (Affective Development)

The affective development of children is an area that has become increasingly important in our modern society. Many young people today do not spend as much time outdoors exploring, playing with other children in their neighborhood, or interacting with social groups outside of the classroom, instead much of their time is spent on activities that typically involve independent play. When leisure time is spent watching television, texting, and playing video games, the ability to developed relationships and social skills can be negatively impacted. In a way, young people today are less connected than ever and this is why building a community at school is so important. Young children learn by observing their surroundings and by watching their peers and adults in their daily interactions. Not only do we learn from each other, but we also desire connectedness with others and the environment (Smith & Sobel, 2010). Constructivist theory emphasizes these social processes and the impact they have on learning (Schunk, 2008).

Studies show that increasing the level of connectedness within a school improves student health and academic achievement ("School Connectedness", 2009). Students want to know that they are cared about as individuals and that they are a part of something bigger than themselves ("School Connectedness," 2009). Maslow's hierarchy of needs identified the want for human connection as a foundational need on which all learning is built (Maslow, 1948). Swinburne (2008) found in her research that it is possible to build a sense of community by way of a school garden. Her study showed evidence of positive behaviors among the interactions between the participants in the garden, such as positive verbal and non-verbal communication, connecting with the land,

and working towards a common goal (Swinburne, 2008). Research findings show that there are positive results in behavior and learning when a community or sense of connectedness exists, and in contrast, learning can be negatively impacted with the lack of community. An example of negative impact is described by the Centers for Disease Control and Prevention (2009), which states that students are more likely to have poor attendance and participate in risk behaviors, such as smoking and using drugs, if they lack a school community.

Another study, published in the journal *Children's Environments*, reported positive results from the participants not only academically, but also socially (Alexander, North, & Hendren, 1995). The school gardens in this study were able to act as a tool connecting students to the natural world and each other. The program consisted of a Master Gardener classroom garden project aimed at providing students with an experiential way of learning about horticulture, gardening, themselves, and their relationships with peers (Alexander et al., 1995).

Through the analysis of interview data, the researchers identified six themes: moral development, academic learning, parent/child/community interaction, pleasant experiences, the influence of the Master Gardener, and perceived problems. The themes identified as moral development and pleasant experiences illustrate how a garden program can positively impact *feeling.* The interview data showed that students participating in the study learned valuable lessons about life, such as delayed gratification, pride, motivation, independence, and cooperation to name a few (Alexander et al., 1995). Students and teachers reported pleasant experiences related to working in

the garden, and one example is found in this quote from a participating teacher: “They get a lot of self-satisfaction from being able to start with just dirt and building forward to where they’re able to eat what they harvest.” (Alexander et al., 1995, p. 261). Numerous examples of the benefits of this garden program are provided throughout the study, with quotes from students, teachers, and the principal of the school. The researchers were able to report positive behavioral changes in the students at the conclusion of the study.

Waliczek et al., (2001), found further evidence of the importance of affective development with their research study, *The effect of school gardens on children’s interpersonal relationships and attitudes toward school.* The study was aimed at evaluating whether or not participation in garden activities would lead to an improvement in interpersonal skills and attitudes toward school. Although the researchers did not find a statistically significant difference in improved interpersonal relationships among the participants, they did determine that students who participated in the garden activities for their study showed significant improvement in their attitudes toward school (Waliczek et al., 2001). In their conclusion, the researchers further endorse the belief that school gardens provide a hands-on experience for students, and that learning comes directly from the experiences of students (Waliczek et al., 2001).

Feeling connected socially is important in the development of all humans, as is being connected with the natural environment (Louv, 2008). This belief is shared among the following authors:

- According to a study published by Warner (2006), a garden can help bring students closer to their community, aid in the development of a healthy mind,

induce feelings of belonging, increase social connection, and encourage environmental stewardship.

- Johnson & Hurly (2002) state that since nature is a part of all humans, feeling cut off from nature can be detrimental to the formation of identity, especially in children.
- Kaplan & Kaplan (1990) (as cited in Warner, 2006) recognized that nature is all around us in many different forms, from a few trees lining a street to a schoolyard or a backyard. Although we may come in contact with nature in these forms, Kaplan & Kaplan (1990) felt that, "the quintessential micro restorative environment, the one that most closely brings together the multiple themes of the restorative experience into a single, small, intensely meaningful space, is the garden." (as cited in Warner, 2006 p.14)

Developing a sense of connectedness can be seen in the increased development and implementation of place-based curriculum, as well as school gardens. Smith & Sobel (2010), describe the importance of place-based education in their book, *Place-and Community-Based Education in Schools.* Smith & Sobel (2010) describe how connecting with humans and the environment are both critical and interconnected. In defense of the necessity for place-based curriculum, the authors write,

> Place- and community-based education—an approach to teaching and learning that connects learning to the local—has become for us an antidote to one of the most serious but generally unspoken dilemmas in American education: the alienation of children and youth from the real world right outside their homes and classrooms. What's real for many young people is what happens on their computer monitors, television screens, and MP3 players. (Smith & Sobel, 2010, Preface)

The authors provide examples of how teachers have implemented effectively, programs that have positively changed the attitudes and lives of their students. One teacher decided to put the standardized curriculum on hold and focus on providing his students with a more meaningful experience that would teach them about the rich culture and history of their local area. He describes his motivation for teaching in this manner: "Because what they learned in school would also be tied to their own identities, they might also become more willing to invest themselves in the enterprise of formal education" (Smith & Sobel, 2010, p. 45). By making the learning relevant and more meaningful, this approach to curriculum design supports a best practice for student achievement.

Acting (Psychomotor Development)

Cognitive and affective development is easily identified in the literature, but what about the psychomotor domain? What is it that the students are actually doing in the school garden? Research often focuses on the benefits of working in a garden with regard to academic and social development, but less time is spent describing the physical activities that are actually taking place, and how, over time, these abilities are strengthened, resulting in a learned skill.

In order to better understand the *acting* or skill development, we should consider Bloom's psychomotor domain. In this domain, the focus is on manual and physical skills, or the area that Novak would describe as *acting*. Many adaptations of Bloom's original domain have been made over the years. The psychomotor domain model used in this paper was developed by R.H. Dave and is described as one of the most popular and easiest models to follow (Bloom's Taxonomy, n.d.) (See Table 2)

Table 2. Bloom's Taxonomy: Psychomotor Domain

| Descriptors of Major Categories in the Psychomotor Domain | Examples of activity or demonstration and evidence to be measured | Illustrative Verbs for Stating Objectives |
|---|---|---|
| **1. Imitation** - early stages in learning a complex skill, overtly, after the individual has indicated a readiness to take a particular type of action. Imitation includes repeating an act that has been demonstrated or explained, and it includes trial and error until an appropriate response is achieved.<br><br>Observing and patterning behavior after someone else. Performance may be of low quality. | Watch teacher or trainer and repeat action, process or activity<br><br>Example: Copying a work of art. | **Imitation** – adhere, begin, bend, assemble, attempt, carry out, copy, calibrate, construct, dissect, duplicate, follow, mimic, move, practice, proceed, repeat, replicate, reproduce, respond, organize, sketch, start, try, volunteer |
| **2. Manipulation** - individual continues to practice a particular skill or sequence until it becomes habitual and the action can be performed with some confidence and proficiency.<br><br>Being able to perform certain actions by following instructions and practicing. | Carry out task from written or verbal instruction<br><br>Example: Creating work on one's own, after taking lessons, or reading about it. | **Manipulation** - (same as imitation), acquire, assemble, build, complete, conduct, do, execute, grasp, handle, implement, improve, maintain, make, manipulate, operate, pace, perform (skillfully), produce, progress, re-create, use |
| **3. Precision** - skill has been attained. Proficiency is indicated by a quick, smooth, accurate performance, requiring a minimum of energy. The overt response is complex and performed without hesitation.<br><br>Refining, becoming more exact. | Perform a task or activity with expertise and to high quality without assistance or instruction; able to demonstrate an activity to other learners<br><br>Example**:** Working and reworking something, so it will be "just right." | **Precision** - (same as imitation and manipulation), achieve, accomplish, advance, automatize, calibrate, complete, control, demonstrate, differentiate (by touch), exceed, excel, master, perfect, reach, refine, show, succeed, surpass, transcend |
| **4. Articulation** - involved an even higher level of precision. The skills are so well developed that the individual can modify movement patterns to fit special requirements or to meet a problem situation.<br><br>Coordinating a series of actions, achieving harmony and internal consistency. | Relate and combine associated activities to develop methods to meet varying, novel requirements<br><br>Example**:** Producing a video that involves music, drama, color, sound, etc. | **Articulation** - adapt, alter, change, construct, combine, coordinate, develop, excel, express (facially), formulate, integrate, master, modify, rearrange, reorganize, revise, solve, surpass, transcend |
| **5. Naturalization** - response is automatic. The individual begins to experiment, creating new motor acts or ways of manipulating materials out of understandings, abilities, and skills developed.<br><br>Having high-level performance become natural, without needing to think much about it. | Define aim, approach and strategy for use of activities to meet strategic need<br><br>Examples: Michael Jordan playing basketball, Nancy Lopez hitting a golf ball, etc. | **Naturalization** - arrange, combine, compose, construct, create, design, invent, manage, originate, project-manage, refine, specify, transcend |

Bianca Swinburne (2008) describes the way that interactions in a school garden can contribute to the development of community, and through her thorough description of observations, she reveals the skills acquired in the process. Swinburne's research takes place in a new school and was developed in order to help create a school community among the students and teachers. In her study, Swinburne (2008) used the following definition for community:

> Community is the interconnectedness between diverse groups of people. It includes verbal and non-verbal communication, practiced with joy and respect. People in a community are able to work in varied groups with a common purpose. Members invite others to work together with them and include and value everyone in the community. The element of democracy should be represented. Community members share in making decisions and tending to responsibilities. Ultimately community should connect us with each other and with the land. (Armstrong, 2001) (as cited in Swinburne, 2008 p. 1)

The results of the study provided evidence that the interactions between the participants, which took place in the garden, did strengthen characteristics of community (Swinburne, 2008). Although the research focused on community and social interactions, the discussion of the interactions that were observed demonstrated the power of hands-on active learning, or *acting*. Swinburne (2008) provides examples of high-rated and low-rated teacher interactions. In the high-rated events, students were given herbs to pass around, smell, and discuss the differences in aromas. Students also walked through the garden, collected specimens, and replicated experiments. These activities were given a high rating because the activities were interactive and student driven. The interactions that received a low rating were teacher-directed large group situations, in which the students were required to listen to instructions and answer questions with no hands-on activities and little interaction. The examples provided for high- and low-rated events

indicate that the more physically active the students are during the instruction, the more positive the learning outcome.

The researcher also included notes from her field observations that detailed the interactions that were taking place. Separate entries were made for teacher-initiated and student-initiated events. Provided below are a few examples that illustrate the types of skills being developed, and to which categories of the psychomotor domain they belong:

- A student asks if they can water the plants. The teacher decides to do the watering to demonstrate the proper technique for watering newly transplanted plants. The student will get to water next time. (Imitation)
- Students decide how to put in soil disks to plant squash seeds and then proceed to plant the seeds. The teacher distributes the materials. (Manipulation)
- A student finds a chrysalis in the garden and begins to discuss the stages of development of a butterfly based on a previous experiment completed by the class. (Precision)
- Students decide the plants need water, find a watering can, and proceed to water plants that need more water. (Naturalization)

Through the hands-on experiences that the garden provided, students were able to develop and refine a variety of skills at varying levels.

Numerous other skills are featured in articles describing projects for a single class or the entire school. Nancy Gallavan & Freddie Bowles (2012) wrote about a teacher who, after becoming a master gardener herself, initiated a community garden project with

her third grade class. This article takes the reader on a journey, describing a well-designed and thoughtfully implemented unit on gardening. This teacher understood the importance of building a foundation of gardening knowledge for her students, so before ever entering the garden, the students were required to develop a plan. The planning process included students sharing their prior knowledge of gardens, learning about the history of urban gardening, and gathering necessary supplies and materials. The students took a field trip to the community garden, worked along side an adult gardener, and took notes on ideas that would help them to plant at a later time. The final stages of the gardening unit included students selecting appropriate seeds, planting in the garden, tending and maintaining the plants, and harvesting. In addition to acquiring planting and harvesting skills, the students learned patience and cooperation throughout this gardening project (Gallavan & Bowles, 2012).

The *Social Studies and the Young Learner* journal published a case study by Joy McFadyen (2012), detailing a school project where students worked with their local community to install a rain garden. This project required the students to collaborate with local officials to educate the public on the importance of keeping contaminants out of the local water systems, organizing volunteers, and sustaining the project (McFadyen, 2012). The skills learned during this endeavor went beyond the physical labor of installing a rain garden. In order to gain support for the project, students used a variety of techniques to educate and engage the community: public speaking, PowerPoint presentations, illustrated brochures, and even a skit. In order to develop a successful rain garden, the students also learned how to test the soil and select appropriate plants for the site. Signs

were designed, created, and installed to mark the future location of the rain garden, asking people to stay off of the newly laid soil. When the garden was installed, 540 students helped plant more than 3,000 native plants (McFayden, 2012). The sustainability of the project was ensured beyond the installation of the rain garden when students decided to continue educating the community through presentations, and returned to teach new fifth graders the methods for maintaining the garden the following year.

The Alliance for a Healthier Generation (Feb. 2012) published an article, *Case Study: Engaging High School Students in School Garden Activities*, describing the skills learned by participants in various school garden programs. A summary of the case studies demonstrates the *acting* (psychomotor development) that had taken place at each site.

- Benjamin Davis, a high school physical education teacher, had the mission of teaching students lifelong skills in the garden. Students learned about eating healthy food, cooking, how to grow seedlings, and deliver and plant these seedlings for other schools. (Manipulation and Articulation)
- Highland Park High School uses a community garden to encourage community involvement and teach about health, food, and ecology. Students help prepare soil in the spring, plant seeds, harvest in the fall, and put the garden to bed in the winter. Students also spend time relaxing, playing or exploring in the garden, utilizing it as an urban natural space. This space is also used as a place where students can connect with each other and nature, by having lunch with peers or meeting friends after school. The community garden is also supported by donations of flowers and produce to support local charities. (All Levels of

Psychomotor Development)

- Laurel High School rallied students from the Spanish Club to help install a school garden to raise awareness of healthy living. The students dug up the ground and planted shrubs, herbs, and vegetables. Other students were recruited to help plant and water the garden. The students were said to be "excited about building something new in their school—something they can call their own and be proud of. And they hope to be able to eat the food that they cultivate."(p. 2) (Imitation, Manipulation, Precision)

## Best Practice

School gardens have been shown to have myriad benefits to students who actively participate in garden-based programs. There are a number of matters to consider when developing and maintaining a school garden. This section is dedicated to summarizing literature on the topic of best practices, or suggestions to ensure a successful garden program.

Despite evidence that school gardens have benefits to student achievement and also support curriculum, many teachers do not want to take their students outside the classroom. Teachers often feel they lack the knowledge of how to best utilize an outdoor natural space, maintain control of their students, and manage their time (Dobbs, Relf, & McDaniel, 1998). In order to assess the needs of teachers, Dobbs, et al. (1998) conducted a study in which they aimed to answer the question, "What would encourage or facilitate incorporating horticulture or gardening into the curriculum?" This study used a survey to

determine the needs of teachers with regard to using horticulture or gardening in the classroom. The survey was administered to elementary teachers in the state of Virginia, with 88 percent of the participants expressing an interest in using horticulture or gardening with their students. With such a high level of interest among the surveyed teachers, the results of this study can be useful in providing a guide for the best use of school resources to ensure future success of gardening programs. Table 3 provides a summary of the survey results, in rank of importance, among the respondents.

Table 3. Percentage of positive responses to factors that would encourage incorporating horticulture or gardening into the curriculum. (Dobbs, et al., 1998, p. 371)

| **Item** | **Response (%)** |
|---|---|
| Horticulture-based lesson plans, activities, and posters | 97.3 |
| Monthly newsletter with children's gardening activity ideas | 95.4 |
| Audiovisual materials, such as gardening videotape | 92.5 |
| Monthly newsletter on gardening for students to use | 89.9 |
| Volunteer support, such as Master Gardeners | 86.2 |
| Additional training for teachers | 78.3 |
| Gardening adapted computer program | 77.1 |

With such a demand on teacher's time, planning activities outside of the classroom in an alternative setting may be a challenge. As a result, the largest area of need identified by teachers in this study was additional curricular resources, lesson plans, activities, and posters. The overall results show that teachers would be more likely to engage in horticulture-based activities if they were provided ready-made resources and training.

This would allow teachers to utilize a school garden without any additional time spent gathering relevant resources and preparing lessons.

In California, a study was conducted to identify a best practices model that could be utilized by schools wanting to start or sustain their own garden programs. The researchers chose ten schools to evaluate, each with exemplary instructional school garden programs already in place. The information gathered through interviews with key school members was used to determine a best practices model for implementation, sustainability, and use of instructional school gardens (Hazzard, Moreno, Beall, & Zidenberg-Cherr, 2011).

Key members were identified as people with direct involvement in the success of the school garden, as reported by the school principal (Hazzard et al., 2011). From these interviews, the researchers identified four fundamental areas: people, funds, materials, and instruction. It was determined that in order to ensure a successful and sustainable school garden program, schools need a group of dedicated people, and creating a committee is an important step towards reaching this goal (Hazzard, et al., 2011). The recommendation was that the committee consists of members from four groups: school administrators, teachers, parent/community volunteers, and a garden coordinator (Hazzard, et al., 2011, p. 412).

In addition to dedicated people on an organized committee, funding and materials are also necessary. Having the support of school administrators, and the support of several committee members, will make the task of acquiring funding and materials less daunting. Dobbs, et al. (1998) and Hazzard, et al. (2011) found similar results in their

studies, which revealed that in order for teachers to successfully use and sustain a school garden program, they need the necessary materials and instructional support. Without that needed support, teachers often feel overwhelmed or lose interest in the garden. Therefore, it is important to supply teachers with training, standards-based materials, and volunteer support to help reduce their time commitment. One way to meet the needs of the teachers is to partner with local Cooperative Extension programs. The Cooperative Extension system is a nationwide network with offices across the country that offers programs such as Master Gardener, Nutrition, and Family and Consumer Science programs (Hazzard, et al., 2011). Developing partnerships with community groups and agencies is a great resource to help lessen the planning and preparation time for teachers and foster a sense of community.

A number of studies share tips for success; Carroll (2003) provides a list of the ingredients she found to be essential for creating a garden that will last. In her book, Carroll (2003) explores a variety of school gardens scattered across the islands of Hawaii. As a result of several case studies, keys to a successful garden were identified (Table 4). Schools that spent a minimum of one year planning their garden experienced the most positive results (Carroll, 2003). It was also determined that it is important to involve a variety of people in the planning process including teachers, administrators, and students.

Some essential questions to ask when planning a school garden (Carroll, 2003 p. 68):

- Why does your school want an outdoor classroom?
- What are the major goals of the school and how is a garden going to support the goals and objectives of the school's environment?

- What are some major challenges at your school?
- What can be learned in an outdoor classroom?

Table 4. Keys to Successful Gardens Identified by Carroll, 2003, p. 68.

| **Keys To A Successful Garden** | |
|---|---|
| 1. Plan the project before you dig. | 9. Create a funding plan. |
| 2. Gain administrative support. | 10. Anticipate ongoing maintenance needs. |
| 3. Include school custodians. | 11. Minimize chances of vandalism. |
| 4. Encourage participation from other teachers. | 12. Define outdoor learning objectives. |
| 5. Enlist professional assistance. | 13. Develop the mechanics of class visits. |
| 6. Involve community volunteers. | 14. Plant your garden. |
| 7. Make the students planning partners. | 15. Monitor and evaluate changes. |
| 8. Set realistic goals (start small). | |

These questions are just the beginning of things to consider when planning a school garden program. Each site can bring with it a unique set of characteristics, demographics, and diversity of both the landscape as well as the students who will be using the garden. In recognition of the fact that each site is unique, the Life Lab Science Program compiled a *Getting Started* guide (1997). Much of the guide addresses the same recommendations outlined by Carroll (2011): determining the purpose for your school garden, getting administrator and teacher support, and involving the students. The *Getting Started* guide, however, has an added element that can be helpful to schools with a variety of site-specific considerations. There is an option for just about any location, and schools are not limited to just vegetable gardens. A brief overview of garden themes is outlined, providing educators with many different options such as rain gardens, pollinator gardens,

butterfly gardens, and native plant gardens. Selecting a garden site is also given very detailed attention with consideration to sunlight, water, drainage, accessibility, security, and visibility (Life Lab, 1997). Many different resources are available to those who wish to start a school garden, or who are looking for tips to make their existing school garden sustainable. The key to a successful, sustainable garden is to find the resources that are right for each individual site. If planning time is an issue, then a short how-to guide may be the best option for getting a garden started. If more lead time is available, then a complete guidebook can be used as a reference for each step in the process of planning, implementing, and maintaining a school garden.

## Summary

Throughout the literature, researchers and practitioners have used a variety of research methodologies and data acquisition methods contributing to our understanding of the purpose, benefits, and use of school gardens throughout the United States. Table 5 summarizes the research discussed in this literature review and provides examples of the types of research methodologies and data acquisition that have been used in school garden research.

This dissertation study is based on evidence collected using many of the methods described in Table 5 below. Case study is the most dominant research method used in the existing body of literature on school gardens. This research is a multi-case study focusing on three school garden sites. The inclusion of multiple sites allows analysis about the

unique characteristics of individual sites, as well as comparisons that help identify similarities across case study sites.

Table 5. Supportive Body of Research Evidence

| Gardening and Learning Literature | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Data Acquisition Methods | | | | | | | | |
| Research Methodologies | | Documents | Post-Test | Survey | Interview | Video | Field Notes | Photos |
| | Experimental Design | | 9 | 5 | | | | |
| | Correlational | | | | | | | |
| | Survey | | | 5 | | | | |
| | Case Study | | | | 1, 4, 7, 8, 13 | | 1, 2, 4, 7, 12, 13 | 2, 4, 7, 13 |
| | Action Research | 2, 10 | 3 | | | | 2, 6, 10 | 6, 10 |
| | Review | 3, 11 | 3 | | | | | |

*Numbers correspond to Appendix B: Summary Matrix of Garden-based Learning Research

The data acquisition methods used in this study are similar to those discussed in the literature. Multiple data points were used to triangulate data for each research question related to each school garden site, the gardens supporters, and the primary adults involved in garden-based activities. In addition to interviews, documents, field notes, digital photographs, and video were also used to capture events taking place around the school garden sites. Video recordings contained detail that could not have been recorded with field notes alone. Diverse data acquisition methods help strengthen the validity of the reported results.

# CHAPTER 3

# RESEARCH METHODOLOGY

## Introduction

The research methodologies used for this dissertation study were piloted during a preliminary study, which was conducted in the spring of 2012. Irving Elementary School, in Bozeman, Montana, was selected as the single case study to be explored during the pilot. This school garden was selected due to its convenient location, as it is in proximity to the Montana State University campus, as well as its longevity; the school garden was installed in the fall of 2009 and provided strong foundational information for selecting future case study sites. An emergent design approach was used during this investigation to allow for the inclusion of new participants, along with providing the freedom to take the study in a direction that would prove to be most beneficial for future research.

During the pilot study, I was introduced to a variety of people who had a high level of interest in school gardens in their local communities. Additionally, I was invited to attend a number of garden-based events, including teacher training workshops and Gallatin Valley Farm to School (GVF2S) meetings. Farm to School networks can be found nationwide, with the National Farm to School network being broadly defined as "a program that connects K-12 schools and local farmers with the goal of increased student and parent support of the local food system" (National Farm to School Network, n.d.). Locally, the GVF2S network is active in increasing the level of local food procurement in the Bozeman school districts central kitchen, which provides lunch to most of Bozeman's

public schools, as well as providing instructional materials and resources about nutrition education to teachers. Participation in these activities furthered my ability to connect with individuals and organizations that are involved in activities related to using gardening as a tool for student learning. At the conclusion of the pilot study I was able to focus my research questions, refine my interview techniques, and identify additional participants and school garden sites to expand the study.

The role I assumed in this dissertation study was two-fold, as both researcher and participant observer. As the researcher I conducted interviews and gathered data related to the research questions in a setting outside of the garden. When collecting demographic information about a specific school or community, I was able to find a great deal of information through subject searches on the Internet and through local publications, such as a local newspaper, newsletters, or magazines. In contrast, as a participant observer my role was to interact with the environment and social constructs. For example, while participating in a school garden, I was touching the plants, smelling the air, and hearing the student's expressions of excitement and curiosity. When I physically stepped into a school garden, my role shifted from researcher to that of participant observer.

Patton (2002) describes the role of participant observer as one that employs multiple and overlapping data collection strategies: "being engaged and experiencing the setting while at the same time observing and interacting with the participants."(p. 256) This was repeatedly the case when I conducted interviews in the school garden. While discussing the various garden beds with the coordinators of each garden, they would often continue their work watering or tending to the garden. We would taste and smell the

different plants while conducting an informal, conversational interview. This type of experience was important in providing me with a first-hand experience of participating in garden activities and how this can lead to meaningful learning.

The sites for this dissertation study were selected based on their geographic location, as well as the existence of a garden that was producing edible vegetation on the school property. Multiple methods were used during the data collection process including, but not limited to, field notes, video and audio recordings, observations, media publications, printed materials, and photos. In addition, I was also afforded the opportunity to participate actively in garden activities while visiting garden sites. My participation provided me with first-hand experience working in the garden and interacting with both teachers and students.

## My Garden Journey

> Validity is a goal rather than a product; it is never something that can be proven or taken for granted. Validity is also relative: It has to be assessed in relationship to the purposes and circumstances of the researcher, rather than being a context-independent property of methods or conclusions. (Maxwell, 2005, p. 105)

Maxwell's perspective on validity makes the awareness and acknowledgement of one's positionality a critical component when conducting research. During both my pilot study and this dissertation study, I became increasingly aware that the gardening community has a culture all its own. Many of the people I interviewed, or met as a result of my work in school gardens, shared similar ideals and interests not only in gardening, but in the area of environmental issues as well. It was my feeling that it would be important to acknowledge and reflect on my own life experiences and how they may have

led me to study school gardens in the first place. To address my own positionality as a researcher and participant observer, I began a personal journey of working in a garden program.

Veronica Galyie (2011) stated, “Research in gardens requires font-line work alongside educators and students. The work of gardens nurtures processes of conceptual-work, grounded knowledge, and physical labour; garden research requires the inclusion of all such elements.” (p. 168). This statement inspired me to experience a garden first-hand. Up to this point in my life I had no direct experience with gardening. However, I did have many indirect experiences with gardens while growing up in southern California.

My grandparents and father always kept a garden, and my siblings and I spent many hours exploring these gardens during the summer months. My grandparents lived in a small, rural community not far from the city where I grew up. I have fond memories of exploring the planted rows of tomatoes, hunting for fat green worms to pull off of the plants by my grandfather’s large strawberry patch, and marveling at the cucumber vines that grew several feet into the air as they climbed up the poles that were mounted in the garden.

My father grew melons, okra, eggplant, and a variety of other vegetables in our small backyard in the city. Even though I had access to these gardens, I was never involved in the hard work necessary to grow and maintain a successful garden. In fact, I did not know the first thing about digging rows, planting seeds, watering, or when to harvest.

In order to experience a garden first-hand, I decided to volunteer in a horticulture therapy program beginning in the spring of 2012. This program was offered by a facility that provides recreational therapy classes to people with disabilities. The class met one day a week for two hours starting in February, and continued until the last fall harvest in October. I quickly realized that I had much to learn. We spent several weeks talking about which seeds to buy, the amount of space we had available, the produce that would best sell at the local Farmers Market, and the number of volunteers we would need to work during the summer months. The enthusiasm of the participants in the class was immediately inspiring. Together, we learned about starting seeds indoors under grow lights, the ways to propagate houseplants, and making worm tea!

For as long as I can remember, I have had an affinity for nature, from admiring a view of the distant mountains to observing the intricate details of a blossom. As a parent, my husband and I have encouraged our children to be curious about the natural world. We will stop on a hiking trail to watch a caterpillar taking its long journey across a path, paying close attention to the way its body moves, the length of its hair, and the colors and patterns on its body.

These pastimes that I have indulged in my whole life, came together in the garden like a magical wonderland of nature at its best. Digging in the dirt can be hard work, but knowing that you are doing your part in preparing the soil to grow food is highly motivating. I could not wait to go weed the empty garden plot, and measure and rake the freshly tilled soil into even rows for planting. My curiosity and observation skills were most definitely at a heightened state. After my daughter and I spent an afternoon planting

peas, we would go back each week and carefully examine the soil to see if there was any sign of life emerging from the ground. This excitement went on for weeks as the garden came to life. Below are a few passages from my field journal that articulate my thoughts and feelings about working in the garden:

May 7, 2012 9:30 am - 12:15 pm

- Met Greg in the garden to measure and stake out rows
- Raked the walkways
- Planted 100 white onion sets
- Hand-watered the newly planted onions and garlic
- This was a lot of hard work. I loved every second of it. It is amazing how precise Greg is with the measurements (of the rows and walkways). I've never used a hoe before. I've never planted vegetables before. I feel proud of the hard work I did today.




Photo 2. Eagle Mount Garden in May of 2012

July 7, 2012 10:30 am - 12:00 pm

- Weeding
- Transplanting strawberries
- Harvesting lettuce, mint, and onions
- Thinning out the carrots
- Hard work today. There is so much to do in the garden and everything is overgrown. This was emotional for me. I am frustrated that it doesn't look perfect.

July 24, 2012

I stopped by to hand-water the garden. It has been 10 days since I have walked through the garden. I was amazed! It truly is magical to watch a garden grow. The potatoes are almost waist high. The squash is starting to bloom. The chard is huge. I spent 30 minutes just looking at all of the things growing and how they are progressing. I've learned so much about gardening, yet there is so much I still don't know.



Photo 3. Eagle Mount Garden in July of 2012

I felt a strong sense of obligation and pride towards the garden at Eagle Mount and looked forward each week to the time I would spend there. In addition to the emotional connection I had developed with the garden itself, I also developed new friendships with the participants, and acquired many different skills associated with horticulture. Working in the garden was a positive experience for me, and gave me a greater understanding of how participating in garden-based activities can impact a person. From this experience, my feelings about connecting people, specifically children, with the natural world were strengthened. I would definitely encourage others to spend time outdoors working in nature in some capacity.

## Research Methods and Data Acquisition

Following Maxwell's model, I have outlined the four parts of the methods component for my research design: (1) the relationships established with the participants in the study; (2) the selection of settings, participants, times, and places of data collection, and other data sources, such as documents; (3) data collection methods; (4) data analysis strategies and techniques (2005, p. 4). Maxwell's research design is a good fit for this dissertation study because it uses a qualitative approach and allows for flexibility and change as the study develops. The methods components of the design focus on answering the question, "What will you actually do to conduct this study?" (2005, p. 4).

### Relationship Building

The first component of my methodology is developing relationships with the participants. This utilizes the components of a naturalistic approach (Lincoln & Guba,

1985), that is, to let relationships develop naturally and in their own time. During the pilot study conducted in the spring of 2012, I was able to establish the relationships that led to the selection of the participants for this dissertation study.

An example of one specific interpersonal relationship that developed over time is that of Mr. Van Vuren (subject) and myself (participant researcher) which led to his involvement as an interviewee of this study. Mr. Van Vuren, the Principal of Hyalite Elementary, and I met in January of 2012 at a Farm to School Champions Network meeting. This was a public meeting held in the Bozeman Public Library. As a result of our shared interest in school gardens and garden-based learning we were introduced by a mutual acquaintance. Once Mr. Van Vuren learned of the pilot study that I was conducting and my dissertation topic of school gardens in Southwest Montana, he agreed to have Hyalite Elementary be a part of this dissertation study. As he and I continued to work together he introduced me to the FoodCorps service member, Ms. Jackson. She began her position at Hyalite Elementary in the summer of 2012 and agreed to meet with me. During our meeting I was able to observe Ms. Jackson teaching students and conduct an informal interview. Ms. Jackson also guided me on a tour of the school garden. Our developing relationship then led to Ms. Jackson identifying an additional study participant, Mrs. O'Shea, first grade teacher, Hyalite Elementary School.

This method worked well for my research design because it allowed for a great deal of flexibility. A similar scenario took place at each case study site. I would make initial contact with a supporter of the school garden and the developing relationship led to

the identification to additional participants. If I had chosen to use a more structured research design, I may have missed out on several valuable connections and interactions.

Sampling Procedures

The second component described in the methods section of this study is related to the selection of sites and participants. Merriam (2012) defines case study as, "a bounded system, a single entity, a unit around which there are boundaries" (p. 178). For this dissertation study the bounded system to be explored is the three gardens and includes the supporters of the gardens, and the interview participants. This particular model, case study, was chosen because it was the best fit for gathering information about and sharing the story of each individual school garden site. Case study research as described by Gay, Mills, and Airasian:

> …rooted in the context of the study and is also related to the readers' knowledge, experience, and understandings as they compare and contrast the case to their own life experiences. Case study knowledge is interpreted by readers who are affected not only by the context but also by the populations the reader has in mind. Most important, what we learn from a single case is dependent on the ways in which the case is like and unlike other cases. (2009, p. 426)

With this definition in mind, multiple case studies were conducted, as the expectation was that each school garden site would almost certainly have its own history and culture. Each site selected is unique in location, design, and size, but they do share common elements, such as the length of time the garden has been in existence, similar climates, and the individuals that are involved in using and maintaining the school garden.

The sites and participants were chosen using purposeful sampling, selecting the participants who would provide the richest descriptions and have intimate knowledge of

the research subject (Patton, 1990, p. 169). The use of this type of sampling allows the researcher to choose the most information-rich settings and seek out the most knowledgeable participants.

The individual participants were selected based on their willingness to participate, as well as their ability to provide the most rich and detailed information about each school garden and its history. The final case study selection included an elementary school in Ennis, MT, a middle school in Livingston, MT, and an elementary school in Bozeman, MT.

Data Collection

Component three, the data collection for each individual case study, includes site visits, observations, interviews, and participation in garden-related events. During my participation in activities at both public schools and community events, I was able to continue building and maintaining working relationships with the participants of this study. That is, my frequent attendance at the school sites and other off-site events helped me build a rapport with the people I interviewed.

To ensure the most credible findings, data was collected for each of the case studies through a variety of methods (See Table 6). Triangulation is often used in qualitative research to strengthen the reliability of the research results, and that method was employed here. This process includes using multiple methods of data collection and a variety of data sources to form the most complete picture of the subject being studied (Gay, et al., 2009). Visits to the gardens, artifacts, documents, and maps were collected to provide detailed information on the layout and location of each school garden. At least

two visits per site were made during the fall of 2012, and the resulting observations and informal conversations began the data collection process. Following the initial site visits with key informants, other participants were identified and contacted, which resulted in personal interviews.

Table 6. Triangulation of the Data with Each Research Question

| Research Question | Interviews | Video/Photo | Personal Observations | Additional Evidence |
|---|---|---|---|---|
| 1. How do the three facets of Meaningful Learning Theory—Thinking, Feeling, and Acting—help explain school gardens at three schools in Southwest Montana? | Teachers<br>FoodCorps/ AmeriCorps<br>Principals<br>Community members | Teachers<br>FoodCorps/ AmeriCorps<br>Students | Student behavior<br>Participation in garden-based activities | Newspaper<br>Local media<br>Websites<br>Lesson plans |
| 2. What are the motivations and activities of key participants (teachers, government organizations, school principals, and community members) related to the success of the school gardens at the three study sites? | Teachers<br>FoodCorps/ AmeriCorps<br>Principals<br>Community members | Teachers<br>FoodCorps/ AmeriCorps<br>Students | Teachers and students in the garden | Newspaper<br>Press releases<br>e-mail updates<br>Facebook |
| 3. From the perspective of the adults involved at each garden site, how have the three school gardens evolved over time? | Teachers<br>FoodCorps/ AmeriCorps<br>Principals<br>Community members | | Growth and maintenance of the garden plots | Magazine publications<br>Websites |

## Interview Description

Interviews were conducted using two different methods. The first method was the informal conversational interview, which offers maximum flexibility to pursue information in any direction that appears relevant to the topic of school gardens during the natural flow of conversation (Patton, 2002). Depending upon the circumstances of the interview, such as spontaneity or location, some of these discussions were not recorded. In the event that the conversation was not recorded, all details of the conversation were

written down as soon as possible for accurate recall. To ensure accurate interpretation of the responses given by participants, member checking was used to provide the interviewee an opportunity to confirm or further explain his/her responses.

The second interview method used was an interview guide approach in which a list of questions was used to focus the interview and delimit in advance the topics to be discussed (Patton, 2002). An example of possible interview questions is provided in Appendix E. Most often the interviews were conducted in a classroom, the participant's home, the school garden, or over the phone. These interviews typically remained informal in character, lasting approximately 30 minutes to 1 hour. Most of the interviews using the interview guide approach took place after an initial meeting, discussion, or visit to the school garden. This allowed for a more focused conversation, directed toward specific questions, to gain a deeper understanding of the information shared by the participant.

Interview Participants

The participants for this study included teachers, principals, FoodCorps service members, an AmeriCorps VISTA, and community members that were key contributors to each school garden. Participants were selected based on their level of involvement with the school garden, as well as their willingness to be interviewed. All participants were contacted via electronic mail or phone, as well as face-to-face meetings, and provided written consent to be part of the case studies. The majority of the interviews were conducted in-person, with a limited number of interviews taking place over the phone.

Video and Photographic Evidence

While visiting each of the school garden sites, photographs were taken to record the state of the garden at that particular time. The photographs are valid and reliable digital evidence of each garden and the varied stages of development documented during site visits. This visual record was part of the study's data set and contributes to the results. In some instances video recordings were also created to document events taking place at the garden sites. Events video recorded included public community gatherings and classroom activities with students. The video recordings ranged in length from 2-6 minutes. The recordings were made spontaneously and recorded on either a digital camera or cellular phone. The recorded events contributed to the descriptive data and provided supporting empirical evidence leading to the results.

Description of Personal Observations

Personal observations provide a rich and more complex description of the gardens and social interactions taking place during site visits. While visiting each school garden, notes were kept in a field journal. The journal notes included physical descriptions of each garden; size, number of raised beds, watering system being used, type of vegetables growing, amount of vegetation, and additional artifacts, such as sheds, tools, hoses, and rain barrels. My field journal also included descriptions of interactions observed when students, teachers, and volunteers were present in the garden. In addition to my own observations, notes made during informal conversations with interview participants were recorded in the field journal.

Description of Additional Materials Used as Data

Along with interview transcripts, photographs and personal observations, additional materials were also used to inform this study. The types of materials collected varied for each case study. This included printed matter, online publications, electronic mail correspondence, and webpages. Additional materials used in this study were:

- Newspaper and magazine articles
- School monthly newsletters, webpages and facebook pages
- Non-profit agencies webpages, facebook pages, and newsletters
- Printed curriculum materials
- Printed fliers for local events
- Electronic mail correspondence containing garden related updates

Listed here are several websites, which provide evidence about the gardens and their ecological social context:

- http://www.montanafoodcorps.org
- https://foodcorps.org
- http://prevention.mt.gov/vista/about/currentSites.php
- https://www.facebook.com
- http://www.bsd7.org/hyalite/aboutus.php
- http://www.livingston.k12.mt.us
- http://www.ennisschools.org

A sample of these materials is included in Appendix G

## Case Studies: Site and Participants

Prior to selecting the individual participants, a preliminary screening process was used to determine which sites to include for case study. Five cities in Montana were considered in the preliminary research: Helena, Missoula, Livingston, Ennis, and Bozeman. These cities were considered because of their proximity to Montana State University and the existence of established school garden programs in their public schools. Of these five cities, three were included in the final selection. The two locations that were eliminated from this study were Missoula and Helena. These cities were not selected for further research primarily due to their distance from MSU and the time that would have been required for travel in order to conduct multiple site visits.

The following case study sites were selected after the preliminary research was conducted to confirm the appropriateness of each site. Many potential sites were identified through the use of extensive Internet searches, as well as existing knowledge of potential interview participants. In order to eliminate inappropriate data and narrow the study, additional specifications were considered. Although many different types of gardens are present on school grounds—pollinator gardens, rain gardens, native plant gardens and others—growing food was one of the themes chosen to explore in this study, which limited the possible sites to only those which had an existing vegetable garden. Since multiple site visits were anticipated in the data acquisition process, it was also important that each school be located within reasonable driving distance to Montana State University and my home. With these criteria in place, and because the origin story of each garden was to be a focal point of this study, I further limited the sites to garden

programs that were relatively new, three years old or newer. (See Appendix C) Once all these standards had been applied, I proceeded to initiate contact with people involved with the potential garden programs. This initial contact was used to gauge the level of interest in contributing to the study by either meeting at the garden site for tours or participating in interviews. (See Figure 7)

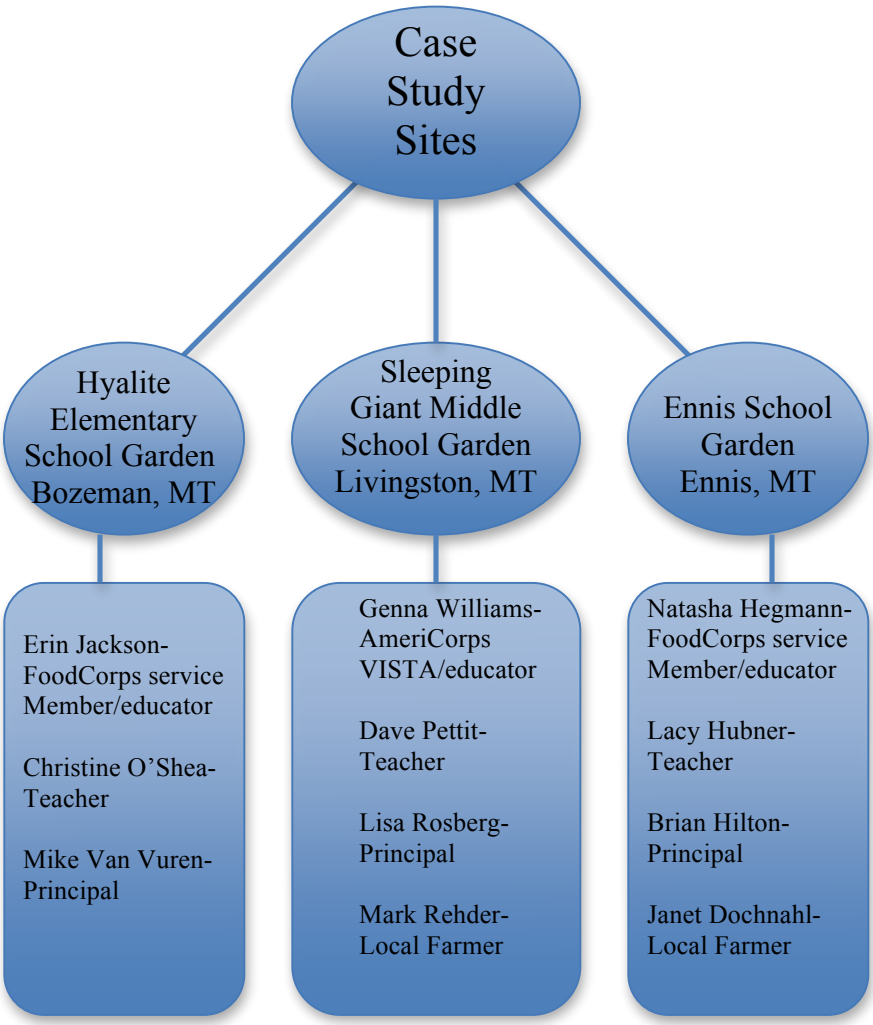



Figure 7. Summary of Research Sample

Hyalite Elementary School, Bozeman, MT

Hyalite Elementary school is located in Bozeman only a few miles from MSU. The garden was installed as a permanent part of the schoolyard, with raised beds built directly into the concrete when the school was constructed in 2009. Teachers from several grade levels use the raised beds to grow a variety of flowers as well as vegetables. The school grounds also consist of many different edible plants incorporated into the landscaping, such as gooseberry bushes and apple trees. The former principal was highly influential in establishing the garden and the landscaping, and her goal in this effort was to provide a variety of opportunities for students to experience the outdoors. The garden is just one of the many ways this school addresses the concept of No Child Left Inside, a Federal initiative established to bring awareness to the importance of children connecting with nature. The new school, components of the edible garden, and proximity made this site a good candidate for the study. Additionally, the principal and support staff is involved in maintaining and expanding their current school garden.



Photo 4. Hyalite Elementary School Garden in September of 2012

Erin Jackson: Erin Jackson is the current FoodCorps service member, with a 12-month appointment at Hyalite Elementary School. Her primary job responsibility is to develop and expand Farm to Cafeteria programs that can be implemented at Hyalite Elementary and others schools in the local area. This is to be achieved by providing teachers with curriculum materials and support to further students understanding of their local food systems. Ms. Jackson also uses the school garden to teach hands-on lessons to students in the areas of science, nutrition, and art. Additionally, Ms. Jackson is helping to expand the current garden space to increase food production and provide more outdoor classroom space. Although she is new to the school, Ms. Jackson's background and education in the areas of nutrition, life sciences, and food systems is valuable as it pertains to the relevance of school garden programs.

Christine O'Shea: Ms. O'Shea is a first grade teacher at Hyalite Elementary. She has been very active in using the school garden on a regular basis since the school opened in 2009. She has participated in continuing education workshops in the areas of environmental stewardship, connecting children with nature, and outdoor education, and she has written numerous articles on the importance of getting children outside and connecting them with the natural world. Ms. O'Shea was instrumental in the development and installation of an outdoor classroom, which she uses regularly with her students. She has been teaching at Hyalite Elementary since it opened and has first-hand knowledge of the history, purpose, and successes associated with the school garden.

Mike Van Vuren: Mike Van Vuren is the principal of Hyalite Elementary School and has a desire to increase the use of the garden plots as well as expand the current garden, which currently consists of six large, raised beds. Consistent with the concept of No Child Left Inside, Mr. Van Vuren has encouraged his faculty to utilize the outdoor space available at the school and the surrounding area. It is his belief that incorporating the great outdoors of the Bozeman area will increase student motivation and engagement. With his role as the building supervisor and his personal beliefs of the benefits of getting children outside, Mr. Van Vuren can provide valuable insight into the use and benefits of the garden plots at Hyalite Elementary School.

Sleeping Giant Middle School, Livingston, MT

Sleeping Giant Middle School, named after a prominent peak in the Absaroka Mountain range, is located less than 30 miles from Bozeman in the town of Livingston, Montana. This middle school consists of grades 6-8; however, the building is connected to East Side Intermediate School, which is comprised of grades 3-5 and an additional Preschool program. As a result of the shared school grounds, both the elementary and middle school students are able to utilize the school garden, which was installed during the spring of 2012. The garden started as a class project for seventh-grade science students, but is now used as a supplemental tool for teaching hands-on lessons to second- and fifth-grade students in their Farm to School elective class. This school garden consists of five raised garden beds, which have been used for growing vegetables. In addition to planting and growing food, the students at SGMS are contributing to the local school community by donating their produce to the cafeteria, as well as learning about

hydroponics and year-round growing. This new school garden has been a tool for expanding the hands-on experiences of the students and teachers at both Sleeping Giant Middle School and East Side Intermediate.



Photo 5. Sleeping Giant Middle School Garden in September of 2012

Genna Williams: A newly appointed AmeriCorps VISTA assigned to the Livingston school district, Ms. Williams is also new to Montana and wasted no time putting the school garden to use. She joined the district in August of 2012 and immediately began working on Farm to School Projects, which included restoring the neglected school garden, planting in the greenhouse, and organizing a local event: the Yellowstone Food Festival. Ms. Williams works with second, fifth, and seventh-grade students teaching lessons on health, nutrition, and food production. Although she is new to the school garden at SGMS, Ms. Williams has provided valuable insight into the future use of the school garden and the continued success of garden-based education programs as they continue to grow in the Livingston School District.

Dave Pettit**:** Mr. Pettit is the seventh-grade science teacher at Sleeping Giant Middle School. Attached to his classroom is a large greenhouse, which includes a hydroponics bed that can be used for year-round growing. Mr. Pettit's class installed five raised garden beds located just outside of the seventh-grade science classroom during the spring of 2012. This 42-year veteran teacher is a strong believer in the use of hands-on activities and experiential education, and works under the motto, "do it, see it, experience it."

Lisa Rosberg: Lisa Rosberg is the principal of Sleeping Giant Middle School. Ms. Rosberg is new to the area, having moved from the state of Washington in the fall of 2012, and was not yet the principal at SGMS when the garden was installed. She did, however, help her former school write a grant to initiate a school garden program, and is of the opinion that a school garden is a valuable tool in providing hands-on learning experiences for students and enhancing science standards.

Mark Rehder: As a community member and local farmer, Mark Rehder helps support the efforts of Livingston schools to teach about nutrition, healthy foods, and local agriculture. Mr. Rehder has made his farm available for school field trips and has worked with Genna Williams, the AmeriCorps VISTA, to develop and implement meaningful learning experiences. His goal is to have Geyser Farms be utilized as an extension of the classroom and to show students that they can grow their own food. By providing students with hands-on experiences at his farm, Mr. Rehder hopes to make lasting changes in the

way young people think about our current food systems and the way they think about food.

Ennis Schools K-8, Ennis, MT

Ennis Schools K-8 is located 52 miles from the city of Bozeman in Ennis Montana, a small town with a population of just over 1,000 residents. The school is home to 181 students in grades Preschool-6. This community is also home to Madison Farm to Fork (MF2F), a group comprised of local farmers, chefs, community members, and volunteers that work together to promote sustainable local agriculture. With a growing interest in sustainable food systems and local agriculture, MF2F worked together with volunteers, teachers, and community members to build a school garden in the spring of 2012. As fate would have it, the school was undergoing construction at the time of the installation, which allowed for the selection of a prime location for the new garden. Positioned on both sides of the sidewalk leading into the building, the garden has become a highly visible and aesthetically pleasing part of the school campus.



Photo 6. Ennis Schools K-8 Garden Entrance

In comparison to the other case study sites, this garden is quite large, consisting of 15 raised beds designed in a variety of shapes and sizes to accommodate various garden themes and vegetation. There are several flowering plants in the garden, but the primary function is to grow vegetables. The support of the community and the considerable size of this school garden are impressive for a school and a community with such a small population base.



Photo 7. Ennis Schools K-8 Garden in September of 2012

Natasha Hegmann: Ms. Hegmann is a FoodCorps service member working in her second year at Ennis Schools K-8. In May 2012, Ms. Hegmann, along with community members and teachers, installed the school garden at the newly renovated school. She has first-hand knowledge of the planning, building, and future direction of the garden. As a part of her job as a FoodCorps service member, Ms. Hegmann also teaches garden-based activities both inside and outside of the classroom. Her goals are to prepare curriculum

related to the garden that can be implemented easily and to establish a sustainable garden program for years to come.

Lacy Hubner: Mrs. Hubner is a third-grade teacher at the rural Ennis elementary school and with the help of Ms. Hegmann, the FoodCorps service member, she has used the school garden to teach a ten-week science unit on plants. Mrs. Hubner reported that the students really enjoyed being out in the garden, and the hands-on experience is both an exciting and effective mode of delivery for science and nutrition education. This teacher provided information on the direct effect of delivering content through the use of a school garden.

Brian Hilton: The principal at Ennis Schools K-8, Brian Hilton, was selected to represent the perspective of the administrator on the uses and benefits of this school gardens. Mr. Hilton has been supportive of the garden program and hopes that many teachers and students will be able to benefit from the new school garden. A native Montanan, Mr. Hilton grew up with farming and ranching as a mainstay in his own life. Additionally, Mr. Hilton has a small garden at home, which he plants and maintains with his children.

Janet Dochnahl: Janet Dochnahl is a community member and serves on the board of directors for Madison Farm to Fork. Mrs. Dochnahl recruited Ms. Hegmann, the FoodCorps service member, to help develop and implement the school garden program. MF2F has helped connect community members and educate students on gardening, agriculture, and food systems through three programs: the Farmer's Market, two large

geothermal greenhouses, and the school garden program. Mrs. Dochnahl is knowledgeable about the community and the school, and can provide information about the development and use of the school garden at Ennis schools K-8.

Data Analysis

The data analysis process for this qualitative research study took place both during and after the data collection process (Gay, 2009, p. 448). The initial analysis began during the single-case-study pilot, which was conducted in the spring of 2012 and continued into the fall of 2012 with this multi-case study. A list of interview questions was piloted and then narrowed to elicit the most meaningful and information-rich responses (See Appendix E). In addition to refining the interview questions, demographic data was analyzed to identify the appropriate sites and participants for the study (See Appendix C).

The fourth component of the methodology is analyzing the data. Using a qualitative research design and case study model, it was difficult to be sure of the technique of data analysis that would be most appropriate. That being the case, the flexibility of my research design was extremely important. For the final analysis the following data was considered: interview transcripts, observation notes, photos, and relevant documents. During the analysis of data, common themes were identified and reported.

The second part of the data analysis takes place at the conclusion of the data collection. Using a three-step process recommended by Gay (2009), all materials were gathered for each case study and then organized by type of data. Materials collected

include printed matter, pictures, video, and websites, e-mail communications, field notes, and interview transcripts. The materials were organized into categories, and the data was examined to identify emergent themes. In order to identify themes in this initial screening of the data, memos and more detailed notes were kept to further sort and organize the data.

A secondary step in the analysis was then applied to the data. This step involved taking a deeper look at the materials and memos from the initial examination, and writing more detailed descriptions of all elements, such as the background and interests of the participants, the settings, and the activities that were taking place.

The third and final step of data analysis involved coding and categorizing the varied data sources into themes. The use of the computer software HyperRESEARCH, designed for qualitative research, was utilized in this stage of the analysis. It is important to note that these three steps don't necessarily take place in a linear fashion (Gay, 2009). As a qualitative researcher, it is important to become familiar with the data not only once but many times over, in order to gain a true understanding of the meaning and relationships being described in the analysis.

Reading and Memoing

The process of reading and memoing varied with each type of data. Photos were grouped by case study and then arranged chronologically, as multiple site visits were conducted during the data collection process. The photos were organized into folders and labeled with short written phrases describing the images in each picture.

A variety of printed materials such as fliers, lesson plan ideas, and posters were grouped with data sources collected from online resources such as blog sites, webpages, and e-mail communications. While reading through written materials, memos were kept denoting repeated phrases or words.

For the interviews, all digital recordings were transcribed and read to accurately recall the conversations and comments that pertained to the research questions. Some interviews were not recorded, but instead detailed notes were kept in a field journal. The transcripts and notes were read and memos of short phrases were used to label the data for further analysis.

In addition to hand written memos and notes, the computer software program HyperRESEARCH was used to further organize the data in digital form. A more detailed explanation of this process will be described in the summary of this section.

Describing

In addition to memoing, and in order to bring clarity to the potentially different perspectives of each of the participants, data needs to be explained in full detail, this is achieved through more extensive written descriptions. In the process of reading and memoing written materials, I read through each document or source multiple times in order to identify as many potential categories or themes as possible.

It is important to note that each interviewee had a different role in their school garden. Some participants had daily or weekly first-hand experience working in the garden with children, while others held a more supportive or administrative role. The individuals also came from a variety of backgrounds and locations. All of these details

were taken into consideration, and contributed to the responses each participant provided during informal conversations and interviews.

Written descriptions were used to explain the events in each of the photographs of the school gardens, which were taken over the course of several months. The school gardens varied in appearance with each season, which is an important aspect to explore when comparing the length of the growing season to the length of the school year.

### Classifying

The data was classified in two different ways. First, all data was grouped by school and location. This was done in order to provide a rich and detailed description of each setting, without making assumptions about the purpose, use, or effectiveness of each school garden in comparison to other sites. The evidence for each of the three case studies was also categorized further by type of data: interview, photo, printed matter, curriculum materials, or observations. As each of these categories was read and described, themes were identified and coded. The coding process was especially helpful in allowing for an easier manipulation of the interview data. Through coding, I was able to identify the interview responses that addressed specific research questions. Coding was also used to identify the ways in which the school garden was used for learning in all three modes: cognitive, affective, and psychomotor.

## Summary

After conducting interviews and collecting sufficient data to tell a rich and detailed account of each school garden, the data was compiled and analyzed. All

interviews were transcribed and analyzed with the use of HyperRESEARCH. The computer software was also used in the analysis of additional data sources: field notes, video and audio-recordings, and other relevant publications. The computer software allowed for the triangulation of data from a variety of sources. As a result of thorough analysis of multiple data sources for each case study, themes in the data were identified and used to answer the three research questions, report additional findings, and establish areas of future research. In addition to the findings of each case study, a comparison of the three sites was discussed to explore any similarities or differences among the school gardens.

# CHAPTER 4

# DATA ANALYSIS

## Introduction

In this chapter, the story of each school garden is told, providing details of the process from the earliest planning stages through the development and use of each space as an outdoor classroom. After analyzing multiple data sources for each case study, reading, memoing, describing and coding interview transcripts, themes were identified to help provide a context for the purpose behind the development and use of each school garden. The results of the data analysis, and how the information applies to the research questions, will be addressed through the use of quotes from garden participants and rich descriptions of each school garden site.

During the analysis of data from multiple sources, codes were created to track the recurrence of specific words, phrases, or sentiments. A sample of the coding process can be found in Appendix H. Once codes for the three sites were identified they were then applied to the text. The excerpt below was transcribed from my interview notes with a community member in Ennis. The underlined text represents the words or phrases that I labeled with the code *Support,* which I defined as evidence of how people provided support to the school garden.

> Reasons for the garden success: a very generous community, high percentage of retired people who want to be connected and involved with the community, they have many organizations that help support the community financially (Women's club, Madison River Foundation, Lyon's Club), also a group of young parents that are involved with the

> community and school and are interested in being an active part of school and community activities, these parents also have a tendency towards sustainable practices, such as raising chickens, or home gardens.

Through this process of coding, several themes emerged that were evident in all three school gardens. These commonalities are listed below as the six consistent themes across cases.

1. Challenges associated with a school garden.
2. Successes associated with a school garden.
3. Hands-on experiential education.
4. Using the school garden as a tool to teach standards-based curriculum.
5. Teaching nutrition education.
6. Plans for future development and sustainability of the garden program.

In addition to the consistent themes found across all three cases, dominant themes emerged for each case site. Dominant themes were identified through the analysis of a frequency report conducted within the HyperRESEARCH program. The frequency report identified the number of times each code was applied to the text. This data set included all interview transcripts and field notes, but did not include descriptions of photographic or video recorded evidence. These sources were excluded from the frequency report to ensure reliable results due to the variability in the number of photos and videos for each school garden. Table 7 provides a graphic representation of the dominant themes that help describe the context for each case study.

Table 7. Dominant Themes of Each Case Study

| Themes | Hyalite Elementary School | Sleeping Giant Middle School | Ennis Schools K-8 |
|---|---|---|---|
| Personal Investment | X | | |
| Connecting Children to Nature | X | | |
| Fresh and Local Food | | X | X |
| Garden Supporters | | X | X |
| Hands-On/ Experiential Education | | X | X |

## Results

In this section each case study is presented independently along with supporting evidence of the corresponding dominant themes. To introduce the results for each case study, demographic and background information is provide to establish the context in which the school garden exists. It is my belief school gardens are influenced, to some extent, by the culture of the community in which they are located. To address this, a brief description of the city, surrounding neighborhood, and school is provided.

### Bozeman, Montana

Located in Southwest Montana, Bozeman is known for its mountain views and the opportunity for numerous outdoor activities. Bozeman has a population of just over 37,000 permanent residents and is the fourth most populated city in the state (Montana Demographics, 2012). Bozeman is also home to Montana State University, whose 14,660

students make a significant contribution to the population (Montana State, 2013). Numerous magazines have featured Bozeman as a great place to live. Backpacker Magazine published *The Best Cities to Raise an Outdoor Kid: The Winning* 25, in their August 2009 issue (Stevenson). Bozeman ranked 18th out of the 25 cities, with praise given for the number of homes being located within a 15-minute walk of a trailhead, and for the close proximity of the town to wildlife and national forests. In 2010, *Outside* magazine listed Bozeman as one of the best towns in the West (Neville, 2010). The article provided detailed evidence of the many outdoor opportunities the area has to offer skiing, hiking, fishing, and a short ninety-mile drive to Yellowstone National Park. Additionally, Bozeman is not short on trails for the avid outdoorsman. A number of trail systems exist both in town and within a short drive of the city limits. The readily available trail systems, streams, ponds, and rivers make Bozeman a desirable location for people who enjoy connecting with nature and spending time in the outdoors. This outdoor culture is evident in the activities available to the youth of the community as well. The Children's Museum of Bozeman hosts an annual fishing day, has an outdoor exhibit called the Earth Garden, and houses the Bozone Ozone Bus, a school bus that has been converted into a mobile greenhouse (Children's Museum, 2013). These events and exhibits educate people young and old on the availability of outdoor recreation, the importance of sustainability and how to develop the skills to continue connecting with nature for years to come.



Photo 8. Aerial View of Bozeman, MT (MSU, 2013).

Hyalite Elementary: This neighborhood school is located on the west side of Bozeman and served 563 students in the 2012-2013 school year, from grades K-5 (Montana OPI, 2012c). The school is located in a mixed-use neighborhood of multi-family homes, apartment buildings, and single-family homes. Working class families and college students make up the majority of the residents of the neighborhood surrounding the school. Hyalite Elementary was built in 2009, to meet the demands of a growing community. Working closely with the concept of "No Child Left Inside", the school was built with this in mind and takes advantage of the surrounding natural spaces. An outdoor emphasis was important to the school administration and has been incorporated into the landscaping and adopted as the theme for the school. The students voted on school colors and a school mascot name in 2010, and are now known as the Hyalite Hikers. Even the school mascot, a hiker, reinforces the outdoor theme carried throughout the school. Further, on the school webpage, one of the school objectives states, "Because one of the factors of an effective school is student engagement and motivation, we utilize the great outdoors around us in Bozeman, Montana as outdoor classrooms" (Hyalite, 2012).

Additionally, the integration of environmental education throughout the curriculum has been shown to improve performance on standardized tests (Hyalite, 2012). With access to the Bozeman Pond, a creek running through the school grounds, and built in garden beds, the students have the opportunity to take advantage of a range of the outdoor amenities that Bozeman has to offer.

School Garden Description: When Hyalite Elementary school was constructed in 2009, the outdoor culture of the school was integrated into the landscaping and the design of the playground, with gooseberry bushes, apple trees, plum trees, and garden plots built directly into the concrete on the playground as a permanent feature of the school. Each garden bed measures eight feet by eight feet and is inlaid into the surrounding concrete. Originally, the garden plots were constructed so that the garden was planted directly into the soil in squares dispersed throughout the concrete. Later, wooden borders were added to frame the garden plots, in addition to more soil, to create raised garden beds. These modifications to the original garden plots were made to help prevent the students from walking through the gardens, and to make planting easier for small children. There are a total of seven raised beds, more than enough to have a dedicated garden plot for each grade level. Having the garden integrated into the concrete portion of the playground allows students to walk past, observe, interact, and play near the garden during recess, in addition to designated gardening lessons that take place during class. Students have full access to the garden space on a daily basis, even when formal learning is not taking place.



Photo 9. Raised Garden Beds Inlaid in Concrete at Hyalite Elementary.

Several teachers have used the garden over the past three years, with the addition of an appointed FoodCorps service member during the 2012 school year. The garden contains:

- Seven raised beds
- Several benches for seating during garden-based lessons, as well as recess
- Storage shed
- Garden tools; shovels, kid sized gloves, hoses
- A timed drip system
- Handmade popsicle stick labels for planted rows
- Three Sisters Garden (corn, beans, and squash)
- Sunflowers
- Marigolds
- Spinach
- Lettuce
- Radishes
- Chard

The school has been responsible for providing many of the garden supplies, although there is no budget designated specifically to the garden. Mrs. O'Shea is one of the first grade teachers, and has made many contributions to the school garden, sometimes bringing her own supplies from home. The following interview quote is evidence of her level of personal investment.

> "The sunflowers that we planted were some that I harvested from my own garden—I have the Russian mammoth sunflower seeds that I harvested, and they are huge, taller than the kids…My kids, this year, planted various seeds that I had, just my own personal seeds. So, that's growing out there now, and we just went out there today to water it, just to make sure it's growing." (O'Shea)

Dominant Themes: The two most dominant themes that help describe the purpose and use of the garden at Hyalite Elementary School are as follows:

1. The adult participants have a high level of personal investment.
2. There is a strong desire to connect children to nature.

Evidence to support these themes is provided through quotes from interview transcripts and descriptions of activities performed by individuals, as reported in printed material, on webpages, and other online publications that have been produced by the school, local media, or government agencies.

A high level of personal investment is defined by the experiences, actions, and activities of the individuals involved with the school garden at Hyalite Elementary. This includes personal time spent outside of the typical school day that is dedicated to enhancing outdoor experiences for students, as well as garden-based learning.

As a FoodCorps service member, Ms. Jackson is dedicated to serving the community and working with school age children to promote food related topics, such as nutrition, sustainability, local food systems, farming, cooking, and gardening. Ms. Jackson's personal experiences, building a home and planting an organic garden with her family as a child, have instilled in her a passion for promoting healthy living (FoodCorps, 2011b).

Farm to School is another area in which Ms. Jackson has experience, through her work in a Vermont based program titled *The Healthy City Youth Initiative, a program of Friends of Burlington Gardens*. These types of life experiences illustrate the personal investment Ms. Jackson has towards creating a sustainable, garden-based learning program for the teachers and students at Hyalite Elementary School.

Even when the school garden is 'hibernating' for the winter, Ms. Jackson found creative ways to connect with students and reinforce the healthy eating habits they have learned. The following two examples are regarded as evidence that Ms. Jackson participates in activities with students during the winter that reinforce what they had learned in the school garden before the first snowfall. I have categorized these events as *personal investment* due to the fact that the school garden is not currently accessible to the students and yet they are still experiencing fresh produce and participating in food related activities.

> In February, Erin Jackson sits with the second graders enjoying fresh dumplings in celebration of the Chinese New Year. The students created their own dumplings by adding chopped vegetables of their choice to dumpling wrappers. The end result was quickly devoured dumplings and two thumbs up from the students (Facebook, February 2013a)

> In the kindergarten classroom, Ms. Jackson celebrated the letter V with the students by making vegetable soup. This hands-on activity involved little chefs (Kindergartners) chopping, and cooking the veggies, resulting in a palate-pleasing soup. Here is what the students thought: "This soup is MARVELOUS!" "This is the best thing I've EVER tasted!" What about ice cream? "This is better!" and "This is so so so so so good!" (Facebook, February 2013b)

Mrs. O'Shea has dedicated a great deal of her time, both personally and professionally, to connecting children to nature and encouraging them to spend more time outside. As a teacher, Mrs. O'Shea has attended a number of professional development workshops geared toward environmental education. She has a passion for gardening and enjoys teaching her students in the outdoor classroom space (riparian area). The riparian area was developed by Mrs. O'Shea and a fellow teacher, it was the resulting project of a professional development program, *Forest For Every Classroom*.

To further illustrate the extent to which Mrs. O'Shea is personally committed to connecting children to nature, three excerpts from the interview transcripts are proved below:

> "My husband and I, over the weekend, came in and took all the thistle out".

> "I try and take them [the students] out to the riparian area once a week, at least. I would say that once a week I'm taking them outside, whether it's over to the garden plot or to the riparian area. Because I just like teaching outside".

> Deb and I were in a class called Forest For Every Classroom for a year and, before that, I was involved in SILC, which was an MSU-type grant program of professional development for teachers…2-year program for teachers to teach inquiry. So, it was basically SILC: Science, Inquiry, Learning, Community was what it stood for. So, I did that for two years. A lot of that inspired this… I've had some other outdoor classroom professional development, and I went to Yellowstone for a week and took some how-to-teach outdoors type of classes. (O'Shea)

The principal of Hyalite Elementary School has also gone beyond his daily responsibilities as a building administrator to promote and further develop the existing garden to better serve the needs of the students and the surrounding community. Mr. Van Vuren and I first met in January of 2012, at a Farm to School Champions Network Meeting held in the Bozeman Public Library. Like myself, Mr. Van Vuren was there to gather information on school gardens and network with people who had knowledge and interests in the area of gardening and school garden programs. He is dedicated to promoting and sustaining the school theme of "No Child Left Inside," and has worked with community members to repurpose the school playground to better connect children with nature.

A natural playground is being installed in phases, with phase one already complete. In addition to creating a natural play area, the principal is working with Erin Jackson (FoodCorps service member), as well as using Montana State University faculty members as consultants to find ways to extend the growing season, in an effort to increase the amount of time students are using the garden for hands-on learning.

Over the past year, Mr. Van Vuren has continued to consult with community members to increase the outdoor learning experiences for his students. In the two years that Mr. Van Vuren has been principal, he has retained the assistance of a FoodCorps service member to establish a sustainable garden-based learning program, supported staff in attending professional development on the topic of environmental education, supported and approved the addition of outdoor classroom space (riparian area), and has had a natural playground installed.

How the Garden Is Being Used: School garden programs around the country, and in Montana, can have a variety of uses. One goal of this study was to identify the ways that various participants were utilizing this school garden. After reviewing interview transcripts and talking with three individuals that are routinely involved with supporting and/or using the garden: the principal, a first grade teacher, and the FoodCorps service member, I had a collection of stories describing many garden-based activities. The analysis of additional data, such as the school newsletter and Facebook page, provided further evidence of the ways in which garden-based curriculum was being utilized both inside and outside of the classroom.

In addition to the garden, Hyalite Elementary uses a riparian area designed to be an outdoor classroom, and recently added a natural play area with a path that leads straight to the garden area of the playground.



Photo 10. Riparian Area and Natural Playground Pathway to the Garden.

The dedicated staff at Hyalite Elementary practices the theme "No Child Left Inside" in their regular use of the outdoor spaces available on and around the school grounds. The principal has offered continued support to his staff in their efforts to have

an outdoor themed school. Mr. Van Vuren describes the school garden as a tool for providing another outdoor learning opportunity for the students.

To continue the outdoor theme of the school, the students recently started a composting program. The goal of the new program is to teach students about life cycle processes, sustainable practices, and to allow gardening content to be extended beyond the growing season. Mr. Van Vuren said the following with regard to the reasons that having a garden is beneficial to students:

> I think anytime you can get kids' hands dirty in any type of activity, and not just dirt… any of those hands-on activities that you can do, it definitely heightens the engagement, as does getting them outside the building walls and getting them into the outdoors and making that connection. I think there's enough research out there that it is s a proven thing.

Christine O'Shea has been able to combine her passion for the great outdoors and her gardening hobby to meet the needs of her first grade students. In the spring, the students go outside and plant flowers from seed in the school garden. The flowers are later used to tie into the living organisms unit that is taught in the fall, along with many other science standards that are taught using the garden as a hands-on learning tool. Students use the garden to learn about living organisms, bees as pollinators, identification of plant parts, and the things plants need to survive.

Other uses by Mrs. O'Shea's class include the planting and harvesting of a variety of vegetables. Students are able to plant radishes and lettuce, watch them grow, and then harvest and taste the produce. This gives the students an opportunity to be part of the entire food cycle, from seed to fork. Mrs. O'Shea describes the reasons she uses the garden to teach content standards:

"Students learn by doing, they actually do better".

"The kids get so excited".

"It makes teaching fun. And the kids love it".

> "And they're learning. They're going to learn by doing. Just looking at it in a book or on a worksheet, or even in a movie, is not the same as actually getting your hands dirty and actually planting a plant, or pulling up a weed or transplanting something. And they're so excited to do that. They just love it. I wish that we could do it all year round."

The school garden has been an effective teaching tool for Mrs. O'Shea and has had positive outcomes for her students.

The FoodCorps service member, Erin Jackson, also makes great use of the garden when she is teaching gardening, nutrition, and sustainable practices. Ms. Jackson is able to work with all grade levels and has worked to develop lessons to meet a variety of content standards. During the spring, much of Ms. Jackson's time was spent outside planting with the students. Students learned a variety of gardening skills how to plant seeds, weeding, thinning out seedlings for healthy plant growth, watering, and harvesting.

This garden is also being used for food production, as crops are planted and grown by the students and then harvested for "tasting or sampling". Providing students with an opportunity to grow their own food increases their level of interest in trying a larger variety of fresh vegetables.

Challenges and Successes Associated With the School Garden: Challenges with school gardening were identified through personal observations, photographic evidence, and interview transcripts. The identified challenges ranged from the unavoidable issues of

climate and a short growing season to areas in need of continued development and growth such as teacher interest, outside support, and a dedicated budget.

The short growing season that is inherent in Montana leaves teachers with few options for planting in order for the students to reap the rewards of what they have sowed. The last frost in Bozeman typically occurs in late May and school is out for the summer in the middle of June. This arrangement leaves little time for student participation in the garden during the spring.

Most of the vegetables planted in the school garden need to fully mature within 20-50 days otherwise the seeds planted in spring need to be tended to during the summer in order for returning students to observe the fully germinated plant. This option hasn't always been successful, the result is that many seeds are planted by the children and then left unattended once the school year ends. During a garden tour with Ms. Jackson she told me that many of the sunflowers in the garden had been planted before she had arrived at the school in the summer. After asking around, none of the teachers claimed the plants.

Neglect or lack of volunteer participation during the summer months has also left the school garden to be overrun by weeds. One or two dedicated teachers, along with the custodial staff, have taken on the task of weeding and watering the garden during the summer, but this does not provide the garden with sufficient upkeep. With no garden committee or designated volunteers, the garden is quickly taken over by the prolific thistle, which I observed during a site visit in the late summer.

Another area identified as a challenge, is the lack of adequate planning and prep time for classroom teachers. Many teachers find it difficult to prepare garden-based

lessons due to a lack of time, planning can be even more challenging for teachers who have little or no experience with gardening. Because of these issues, Ms. Jackson is an integral part of the school garden program. Her job is not only focused on teaching students, but also working with teachers to develop lessons that meet academic standards for each grade level. This collaboration between a FoodCorps service member with gardening experience, and the classroom teachers, will help with the future success and sustainability of the garden program.

Funding is another long-term concern for the school garden. When interviewing Mr. Van Vuren, he told me there is no designated garden committee or garden budget. Up to this point, the general operating funds allocated to the school from the district have been used to sustain the garden. He also expressed this concern; the amount of money available for maintaining the school garden may fluctuate from year to year, leaving uncertainty for the future.

Despite some challenges, the school garden has had a large number of successes. The garden is used to provide hands-on experiences, connect children to nature, teach nutrition and add excitement and engagement for the learners. Evidence of these successes can be found in the following statements from the interview participants:

> "Some staff members are just really passionate about gardening"
>
> "A garden is a great place to create an outdoor learning environment"
>
> "The excitement that kids have, you can kind of see it in the lessons…they bring that product into their classroom and they either taste it or work with it or manipulate it…there is a heightened sense of engagement with that"
>
> "The sunflowers are doing so awesome"

Future Plans: Hyalite Elementary School has many exciting plans for the future use and development of their school garden. Mr. Van Vuren shared his plans for the school future development of their current program, in addition to expanding food production, the school aims to integrate the new natural playground with the garden to give students a rich outdoor experience. Future plans identified during interviews with Mr. Van Vuren, Mrs. O'Shea and Ms. Jackson include:

- Increased interest and participation among the teaching staff
- Forming a garden committee
- A larger garden site to increase outdoor teaching space and increase food production
- Supplementing the current backpack program with fresh produce grown by the students to help community members in need
- Increased community support and involvement
- A heated greenhouse for year-round growing
- Securing outside funding, such as grant money
- A sustainable year-round program

Livingston, Montana

Surrounded by the Bridger, Gallatin, and Crazy Mountain ranges, Livingston is abundant in outdoor activities. This town of just over 7,000 people has an old west feel, with a downtown reminiscent of the railroad days that earned Livingston its name as the "the Gateway to Yellowstone National Park." For 43 years, from the early to mid 1900s, people from across the country traveled to America's first National Park by way of

railroad, entering the town of Livingston and traveling one hour to the park's north entrance (Montana Official State Travel Site, 2010). With the Yellowstone River running along the East side of town, Livingston is also renowned for its blue-ribbon fishing.



Photo 11. Livingston, Montana: Yellowstone River near Livingston, MT. (Andrew, 2005)

Sleeping Giant Middle School: Located on the southeast side of town, Sleeping Giant Middle School is grouped with two other schools, East Side Intermediate and Park High School. Sitting at the edge of town, this school is near modestly sized single-family homes, and is across the street from the high school football grounds. The middle school shares a building with East Side Intermediate School, with the east side of the building housing grades 3-5 while the west side of the building is home to grades 6-8. Sleeping Giant Middle School has an enrollment of 338 students, with 42% of the student body eligible for the free and reduced lunch program (Montana OPI, 2013c).

School Garden Description: Seventh grade science teacher Mr. Pettit is a 42-year veteran teacher who involves his class in a number of hands-on and place-based learning activities. Visiting his class, one is immediately engaged and entertained by his outgoing

and energetic personality. In addition to being a dedicated and enthusiastic teacher, Mr. Pettit enjoys the added bonus of having a greenhouse attached to his classroom. The greenhouse is a permanent structure, attached to the south side of the building with its entrance in Mr. Pettit's classroom, and is an exciting extension of the classroom. The greenhouse is equipped with a hydroponic table, as well as an aeroponics grow tower. This combination of equipment, gathered over the years, has allowed Mr. Pettit's students to experience hands-on science activities by growing plants year round.

With a passion for experiential education and hands-on learning, Mr. Pettit did not stop at the greenhouse. In the spring of 2012, Mr. Pettit's seventh grade students installed a garden. The garden is located on the south side of the building, just outside of the greenhouse, and consists of five raised beds.



Photo 12. Sleeping Giant Middle School Garden and Greenhouse.

Timing and good fortune made this garden a reality. The high school football grounds, located directly across the street from the current garden location, were under renovation at the time the garden was being developed. Mr. Pettit enlisted the help of students to build the five raised garden beds, and all of the necessary soil was donated from the

football grounds construction site. One bucket at a time, Mr. Pettit's students carried soil across the street to fill all of the garden beds. For Mr. Pettit, having the students involved in the process was an important component to the success of the garden. The garden at SGMS consists of:

- Five raised beds
- Row covers for extending the growing season and protecting against frost
- Gardening tools
- A variety of fast growing crops; spinach, lettuce, kale, chard, radishes, beets, carrots, broccoli, and zucchini

Dominant Themes: The results of data analysis for the school garden located at Sleeping Giant Middle School brought to light three dominant themes:

1. The presence of garden supporters.
2. Hands-on learning and experiential education.
3. The importance of fresh and local foods.

This study identified several key supporters of this school garden. Although the raised garden beds are accessible to students and teachers, the two people who are primarily responsible for maintaining and utilizing this outdoor space are Mr. Pettit and Genna Williams, an AmeriCorps VISTA assigned to the Livingston school district. These individuals maintain and use the school garden on a regular basis. During two site visits I was able to observe Mr. Pettit and Ms. Williams teaching in the garden. During these visits I made video recordings of the events taking place in the garden. The videos serve as further evidence of their style of teaching and student engagement.

Mr. Pettit describes to me how he has been using hands-on learning with his students for several years, and the hydroponics bed located in the greenhouse was built for his special education students nine years ago. He described his teaching philosophy as follows: “Do it, See it, Experience it!”

Mr. Pettit believes that if you just talk, only a few (students) will remember; if you show them, more will remember; and if they do it, 90 % will remember. Long before the garden was established, Mr. Pettit involved his students in a variety of experiential and place-based education projects. Studying the local watershed, investigating invasive plant species along the riverbanks, and collaborating with schools from other regions on climate studies, are just a few examples of the projects Mr. Pettit’s students have experienced. His passion for making education engaging and relevant makes him a popular and effective teacher.

Another key supporter of the garden program at SGMS has been Genna Williams. She arrived in Livingston in July of 2012 to serve a one-year term as an AmeriCorps VISTA, providing Farm to School and nutrition education to students in the Livingston school district. The garden was established in May of 2012. With school releasing in June, and no plan in place for summer maintenance, Ms. Williams arrived to an almost empty garden.

She was eager to get started planting so the students returning in the fall would come back to a garden that was flourishing. With the use of the greenhouse, hydroponics table, and five raised beds, Ms. Williams was able to grow carrots, spinach, kale, chard, lettuce, radishes, beets, broccoli, and zucchini. In addition to planting in the garden, Ms.

Williams also teaches nutrition and food related lessons in the classrooms, to second and fifth graders, and is working to develop lessons to meet the curriculum needs of the classroom teachers for a sustainable program moving into the future.

Mark Rehder is also a strong advocate of the school garden program, and teaches students about sustainable food systems. He is the owner of Geyser Farms, a six-acre market farm that grows vegetables to sell in a number of local areas. Mr. Rehder believes that Geyser Farms serves as an extension to the school curriculum, as students are given content in the classroom and then provided a hands-on component while visiting the farm. Educating students about where their food comes from, and showing the students how food is grown on a larger scale, are some of the contributions Mr. Rehder makes in an effort to meet his goal of changing the way young people think about food. Mr. Rehder shares Mr. Pettit's philosophy of education and passion for connecting students to the content they are learning. When students visit Geyser Farms they have a chance to explore, take chances, and experience new things. According to Mr. Rehder, "When students visit the farm they will eat anything, even cabbage worms!" "When they see it coming out of the ground, they have to eat it." Mr. Rehder sums up the experience of students when they visit his farm, "See it, smell it, feel it, taste it."

The principal of Sleeping Giant Middle School, Lisa Rosberg, is also supportive of the efforts made by Mr. Pettit, Genna Williams, and Geyser Farms. Mrs. Rosberg is new to the school and was not initially involved in the development of the school garden; however, she expressed excitement about the potential for future growth, and the use of the garden to meet the curricular needs of the students. Before moving to the Livingston

school district in the fall of 2012, Mrs. Rosberg was in pursuit of establishing a school garden program at the school she presided over as an administrator in the state of Washington. Here are some of the reasons that Mrs. Rosberg gave for being supportive of a school garden:

- The more hands-on, the better.
- The garden program teaches science curriculum.
- Indian Education For All standards can be met by teaching about Native crops and gardening practices.
- The garden addresses some environmental issues.
- By using place-based education students are learning about the local area watershed and agriculture.
- The students are proud of their work (building the garden, and growing food).
- The students have an (emotional) attachment to the garden.

How the Garden Is Being Used: As discussed previously, Mr. Pettit is dedicated to providing the most meaningful learning experience he can for his students. For him, this is achieved through hands-on experiences. When visiting the school in late September of 2012, I was able to watch Mr. Pettit and his students working in the garden. This event was video recorded and supported my findings of student engagement through the use of hands-on activities in the school garden.

Each student was supplied with pencil, paper and a clipboard. The students explored each of the five raised beds, one at a time. At the first garden bed the students are given a leaf from a carrot plant and told to draw it on their paper. Then at the next

raised bed they make observations about the color of spinach leaves and are told that it is a super food. Mr. Pettit compares the coloring of the spinach with that of a lettuce leaf and then tastes and describes both of them to the students. The students are asked to draw the spinach leaf and are encouraged to eat it when they are done. During the lesson students are gathered close together and are listening and watch intently as Mr. Pettit describes the plants and provides instruction.

The raised bed containing a variety of radishes elicits the most excitement from the students. After making observations of how each type of radish leaf is shaped different the students do a taste test. As students are told that they will be able to taste the radishes, the level of excitement increases. The students start to move in closer to Mr. Pettit. Some seem anxious about trying the vegetables. Others are touching and holding on to each other in excitement. As they eat the different varieties of radishes they make comments about the taste of each one. Here are some of the more humorous comments made by the students: "That's good. I want more. I want more," "Oh, it burns," and "Wow, wow, wow!" Mr. Pettit and Ms. Williams were able to cover science standards, introduce vocabulary, and provide a hands-on experience for the students during this garden-based lesson. The students ended the lesson by harvesting the remaining spinach and radishes to contribute to the school salad bar.

While Mr. Pettit's main focus for the school garden is providing hands-on experiences for the students while meeting science standards, Ms. Williams places more of an emphasis on fresh and local foods. In September of 2012, Ms. Williams organized the Yellowstone Food Festival. This event was promoted as the "How To" event of the

season. The flier read: “Learn how to grow it, catch it, raise it, hunt it… Come Support the Local Food System!” Using fresh produce from the school garden, Ms. Williams provided samples of easy and inexpensive recipes that people could make at home using produce that is available locally.

Lessons taught by Ms. Williams include the Farm to School content standards, which place an emphasis on Montana agriculture. She also incorporated lessons on Montana history in October; in celebration of Farm to School month a traditional miner’s meal was served in the cafeteria. During one of our interviews Ms. Williams tells me of her efforts to incorporate local food, “This meal was 100-percent locally sourced and consisted of traditional foods commonly eaten by Montana miners.” For the October, 2013 Farm to School month lunch item, plans are to serve a meal that represents the food of the people who are indigenous to Park County. This is what Ms. Williams tells about working in the school garden:

> The thing that I love about gardening is that I can fulfill any kind of curriculum. You can use it in a history class…we’re doing our Montana made meal in October to celebrate farm to school month, so we’re doing a 100-percent locally sourced meal, and John and I just decided that we’re going to start doing it based on history lessons.

Challenges and Successes Associated With the School Garden: Like many school garden programs, there are challenges at SGMS. When discussing the garden with Ms. Williams, areas of concern included the size of the garden, the number of students in the garden at one time, limited teaching time per week, difficulties related to climate, and summer maintenance. The students really enjoy being hands-on in the garden, specifically when harvesting, but with only five raised beds and several classes of

students coming to work in the garden in a given week, not all students are able to participate in the harvesting process. The school is working on securing additional funding, through grants, to expand the current garden area. This money would allow the school to add additional garden plots, increase food production, and increase the outdoor teaching space. Ms. Williams's time is also very limited. As an AmeriCorps VISTA, she only has 30 minutes per week that are designated to working with each group of students. It requires careful planning and preparation to make the most of those precious 30 minutes.

The short growing season in Livingston, which consists of an average of 127 days from May to September, brings additional challenges. Seeds are planted with the students in May, but sometimes a late frost can cause setbacks or delay planting. This leaves little time for the students to observe seeds sprouting and see early crops growing in the garden during the school year. The same can be true in the fall. If there is an early frost, crops need to be covered overnight or there is a risk of losing all of the produce that has not yet been harvested.

With school out of session for the months of June, July, and most of August, there is also the challenge of summer maintenance. There needs to be a plan in place for the summer months, in order to ensure the future sustainability of the school garden. Watering is critical, but is also very expensive. The school garden uses city water, and it can be costly to keep the garden well hydrated during the hot summer months.
The following quotes were taken from one of the interviews with Ms. Williams when discussing the topic of challenges with gardening.

> Doing a garden curriculum for schools in Montana is very difficult because the growing season happens when school isn't in session and, especially this year, coming in, in mid-July like that, that's a difficult time to do planting here.
>
> "We need to figure out a way to maintain all of our gardens during the summer, that was a conversation that didn't happen at the end of last year."
>
> "They plant stuff in the spring so that the students can see it come up and then we just kind of let it all go over the summer and we come back, dig it all up and start over."

The school principal, Mrs. Rosberg, identified challenges related to maintenance, budget, and volunteers. During the first summer gardening season (2012), the building was undergoing construction and the main water supply was turned off for several days. This took a heavy toll on the immature plants in the garden, and many things died and had to be replanted in the fall. Because of the water shortage and low food production, the garden was not able to contribute as much produce as the school had anticipated.

Currently, there is no specific funding for the school garden, which puts limitations on how the garden can be used. No garden committee has been formed to oversee the maintenance and use of the garden, which means that managing the use and maintenance of the school garden is limited to only a couple of supporters. Mr. Pettit uses the garden regularly with his seventh grade science students, but there is potential for future use incorporating several grade levels.

Genna William's position as AmeriCorps VISTA will come to an end in July 2013, at which time the teachers will have to plan lessons and utilize the garden without her assistance and expertise. This leads to additional concerns about the sustainability of incorporating gardening with the Farm to School curriculum.

Future Plans: The future plans for expanding the existing school garden program at SGMS are impressive and exciting. In a follow-up interview with Ms. Williams in late February of 2013, she shared with me the many plans on the horizon for not only SGMS, but also other schools in the district. First, Ms. Williams has agreed to stay on one more year in her position as an AmeriCorps VISTA, which will allow significant follow-through and support for the new programs she has proposed. Ms. Williams was also awarded grant money from the National Center of Appropriate Technologies (NCAT), and plans to use these funds to add 8-10 more raised beds at schools throughout Livingston. Some of the additional garden beds will be installed at Livingston's one elementary school to provide hands-on garden-based learning to students in grades K-3. Additionally, there are plans to install a Native American themed garden to help enhance the teaching of Indian Education For All curriculum, which is a part of the state of Montana standards. The second graders would achieve this goal by planting a Three Sisters Garden, a traditional native companion planting method that includes corn, beans, and squash.

Moving forward with expansion is a district wide effort. The following excerpt was taken from a December school newsletter.

> Wellness and Farm to School: The changes to the school lunch program in Livingston and across the country are opening the door for Farm to School programs. Here in Livingston we're not only providing more fruits and vegetables in our school meals, we're also working to make as many of those items as we can local. Buying locally enables us to serve fresher and often more nutritious foods, support our local farmers, reduce our carbon footprint, and reconnect our students with the food system.
>
> In an attempt to reduce the gap between our students and the food they eat, Farm to School is working to expand our school garden program for the

> coming season. Our raised bed garden at SGMS has been a huge success producing a wide variety of vegetables that have been tended and consumed by our middle school students. This spring at least ten more raised beds will be built at various schools around the district. The program will be offering a paid summer internship to two high school students interested in learning more about sustainable gardening. The produce produced by our interns will go to a small number of Community Supported Agriculture shares during the summer months and into our school meals throughout the year. (Rosberg, December 2012)

Making school gardens a community-wide effort will be something to expect in the future in the town of Livingston. Students from the high school will be enlisted to build all of the new garden beds, and there are plans to employ two high school students to maintain the school garden during the summer months. In addition to garden maintenance, these students will learn about sustainable agriculture practices. This internship program should eliminate many of the summer maintenance issues of the previous year.

Year-round and increased food production is another goal of moving forward with the expansion of school gardens. The middle school received a donation of additional grow lamps, which will allow the students to increase their year-round production capabilities. Ms. Williams also plans to make a departure from the traditional row cropping that is currently being used, and teach the students bio-intensive agriculture practices. In addition to bio-intensive practices, limiting the number of crops to only three will help to increase the overall yield.

In an attempt to further engage the community, and increase outside involvement in garden related support, a Community Supported Agriculture (CSA) program will be established for the 2013-growing season. The CSA shares will be sold to community

members and will consist of weekly produce from garden space that has been secured in the community garden in town. An estimated total of three shares will be made available for the first season.

Ennis, Montana

Ennis is a small town with a rich pioneer and agricultural heritage. Established by William Ennis in 1863 during the gold rush, Ennis still has the feel of the old west, which can be seen in its downtown buildings and neighboring towns of Virginia City and Nevada City. With a population of just under 1,000 residents, Ennis is a tight-knit community of people dedicated to supporting local commerce, farmers, and ranchers. The residents of Ennis, and the surrounding Madison Valley, have long been stewards of the land, water, wildlife and wide-open spaces, with a tradition of respect for the land, sustainability and a rural way of life (Ennis Chamber of Commerce, n.d.(a)). The efforts of community members to keep these values alive can be seen in organizations like the Madison Valley Ranchlands and Madison Farm to Fork, non-profit groups whose goals are focused on sustainability and supporting the local farmers and ranchers.



Photo 13. Downtown Ennis, MT. (Ennis Chamber of Commerce, n.d.(b)).

Ennis Schools K-8: This rural community is home to only one school site, located in the center of town just off of Main St. The elementary, middle grades, and high school share the same grounds, with one building dedicated to grades K-8 and a separate building housing the high school, grades 9-12. During the 2012-13 school year, the kindergarten through eighth grade school had an enrollment of 227 students, and the high school enrolled 96 students (Montana OPI, (2012c). Approximately 35 percent of the population of Ennis is made up of school-aged children. Because the community is comprised of such a large number of children, there is a great deal of community support for the schools, and this is evident in the level of funding and volunteer participation.

School Garden Description: The origins of this school garden, located on the newly constructed school grounds, can be traced back to the efforts of community members and volunteers of Madison Farm to Fork (MF2F), a non-profit organization dedicated to supporting local food production and sustainability. MF2F was established in 2008, and focuses on supporting local agriculture and educating future generations on the importance of local food. Their vision statement echoes the sentiment of many members of the community:

> Madison Farm to Fork (MF2F) is a non-profit organization that has taken on the task of cultivating a countywide foodshed. MF2F seeks to promote local agriculture through support of local growers, producers, and consumers, to implement programs designed to accomplish goals related to education and community outreach in support of healthy locally grown food, and to educate children about food, its production, its value to a healthy lifestyle, and the economics of local agriculture. (Madison Farm to Fork, n.d.(b))

After just one year of service, the organization wanted to find a way to reach out to the schools by providing class activities and field trips to a greenhouse. This was done successfully, but the logistics of transporting students to an off-site facility proved to be time consuming and expensive. With that in mind, MF2F brought a proposal to develop a school garden before the school board. Given that the community already supported local farmers, sustainable practices, and school children, the proposal was easily approved. Timing of the project was also very fortunate. The school was undergoing major construction and the new landscaping had not yet been installed, so the school agreed to install a garden in place of traditional landscaping. Funding for the garden installation was raised by MF2F and the site was ready to go.

In addition to having approval, funding and a dedicated site, the school garden program was established with a garden committee for continued support, as well as a FoodCorps service member. The garden committee is made up of six individuals, consisting of community members and parents who have children attending the school. Twice a month, the garden committee meets to make decisions about the purpose and future goals of the garden. Natasha Hegmann, a FoodCorps service member, also plays a key role in this school garden program. During the planning stages, Ms. Hegmann worked diligently to design a garden that would best meet the needs of the students.

When designing the layout of the garden, many elements were taken into consideration: wheel chair accessibility, covered space for students to gather when the weather is hot, adequate seating, and themed beds dedicated to grade level appropriate curriculum. Due to the rocky soil, it was necessary to use raised beds in the school

garden. With support from MF2F, the school, and community members, the school garden was installed in just one day, on May 5, 2012. Ms. Hegmann recorded eighty volunteers as present during the one-day garden installation.




Photo 14. Ennis Schools K-8 Garden Diagram (Hegmann).

The school garden is a highly visible part of the school grounds, located at one of the building entrances next to the new playground. Students and teachers pass by the garden throughout the day on their way in and out of the building. The garden is large in scale with a total of thirteen raised beds, sunflowers, and other decorative plants located in the flowerbeds outside of the garden fence. The garden is not only functional with a themed bed for grade levels K-4, but is aesthetically pleasing as well. The high school shop class made many contributions, including a fence to keep deer out of the garden, a pergola to cover the walkway between the two gardens and to provide shade for students on hot days, and embellished garden gates that add character and whimsy. The students and community appreciate the beauty of the new addition to their school:

> The community really enjoys the garden. The janitors, lunchroom workers, and bus drivers all comment on how much they love the garden when they are at the school, "it is beautiful" (Dochnahl, 2013).
>
> The high school students lay on the sidewalk in the shade of the sunflowers, some for reading, some for quiet time… an oasis. (Hegmann, 2012)



Photo 15. Ennis Schools K-8 Garden Gates and Flowerbed.

The garden was installed in May of 2012 and in its first season was utilized by the summer camp program, the students of Ennis Schools and the local Farmers Market. The garden contains the following elements:

- Rain barrel
- Weather station
- Three straw bale, three sisters gardens (corn, squash, and beans)
- Sensory garden (tomatillos, anise, lemon balm, drumsticks, bunny tails, parsley, and sage)
- Tops and bottoms garden (carrots, beets)
- Pizza garden (basil, green onions, tomatoes, and peppers)

- Rainbow garden (paprika, red chard, orange nasturtiums, yellow tomatoes, green lettuce, peppers, purple okra, and flax)
- Herb garden
- Raised bed for greens (cabbage, collards, kale, and spinach)
- Raised bed for potatoes
- Raised bed for additional produce (beets, carrots, radishes, lettuce, spinach, and chard)
- Heirloom seed bed (beans)
- Colorful signs
- Garden gates
- Seating
- Flowerbed (sunflowers, perennials, and native plants)

Dominant Themes: Through the analysis and coding of the data, it was evident that this case study site was defined by the same three dominant themes as the Sleeping Giant Middle School garden:

1. The presence of garden supporters.
2. Hands-on learning and experiential education.
3. The importance of fresh and local foods.

The evidence of garden supporters is described here, with detailed descriptions of the use of hands-on experiential education and the emphasis of fresh and local foods are found in the following section outlining how the school garden is utilized.

This school garden is no doubt impressive, but lets not forget that this program would not have been possible without the remarkable support of the community. Funding for this project began with Madison Farm to Fork and later included generous donations from the school board, school booster club, Lions Club, and grant funding. With so many contributors, the school garden has a budget for teacher support and regular maintenance. Janet Dochnahl, a member of MF2F, spoke about the support and generosity of the community:

> "We approached the school board about a site for a school garden and, since they didn't have any landscaping plans yet, it was really easy for them to say yes...so they said, of course, where do you want it?"
>
> Ennis is an incredibly generous community… we have a higher percentage of retirees than a lot of communities…. they are very active, both from a community sense and a physical sense because of fly fishing, or whatever, and they want to get involved. We have a really robust women's club and Lion's club and other nonprofit organizations like Madison Valley Ranchlands and Madison River foundation that have some really active and generous people… it's really easy to go to them and say, we'd like to build a school garden…"great idea, what do you need?" We have a group of young parents here who are also very community minded.

Mrs. Dochnahl was also involved in the development of the education program offered by MF2F and proposing the garden to the school board. To help ensure the success of a garden and nutrition program, Mrs. Dochnahl applied for a FoodCorps service member. She felt that the addition of a FoodCorps service member would be beneficial to the development of a solid garden-based learning program. Natasha Hegmann, of FoodCorps, began working with MF2F and developing plans for the school garden program in the summer of 2011. By spring 2012, Ms. Hegmann had worked with teachers and community members to design and install the new school garden. Not

wanting to miss out on the rewards of all her hard work, Ms. Hegmann decided to stay in Ennis as a FoodCorps member for a second year. The 2012-13 school year was dedicated to developing a strong garden program, with curriculum and lessons in place to sustain the garden program into the future.

In the fall of 2012 I attended a dedication ceremony conducted in celebration of the new school garden and to thank all of the community supporters. Community members, parents, teachers, and students turned out for this event to celebrate the successful installation of the garden. I was able to observe, as well as make a video recording of Ms. Hegmann and other participants as she gave a heartwarming speech to thank all of the donors and supporters that helped make the garden possible. In turn, each of the teachers present at the dedication ceremony made an introduction and described what they loved about the garden. Here is what one teacher had to say:

> A few of us went on tours of other school gardens in the area to check out how their gardens are set up. I tell you, they are going to be boarding buses and coming here because this is the most fabulous garden we have seen. You guys should be so proud of yourselves.

This statement was followed by laughter and applause as the crowd celebrated their success. I observed a feeling of pride and celebration among the crowd as people smiled, applauded, laughed and cheered together in response to the hard work and outcome of the school garden. Natasha holds up a flier she has created and reads it out loud, “Mustang pride, eat your greens”. The school mascot is a Mustang and the school color is green. This elicits laughter, applause and cheers from the crowd.

How the Garden Is Being Used: Mr. Hilton, principal of Ennis Schools K-8, shared with me his own personal experiences with gardening and the reasons he thinks a garden can be a valuable tool for educating young people. Growing up in Townsend, Montana, Mr. Hilton has always known agriculture and ranching as a part of life. Now, as a school principal and a father, he has seen the positive impact of gardening, both at home with his children in their small family garden, as well as with the students in the school garden. Mr. Hilton described the ways in which his own children are impacted and how they learn about planting, sustainability and fresh food when they tend to their garden at home. "They love to go raid the garden, this changes the way they eat… they try more things." These same results are being seen in the school as well. Students have been willing to try new vegetables, and Mr. Hilton attributes this to "the fact that they participated in growing the food and were engaged with their peers during this process".

The school is committed to teaching healthy eating habits by providing the students with a broad range of experiences with fresh, local foods. Mr. Hilton describes other ways in which the school has delivered healthy food experiences for the students; before the school had a garden, local chefs came to visit the school and provided taste tests of targeted foods (squash, legumes, etc.) for the students. The goal of this program was to identify healthy foods that children like to eat, and then incorporate these items into the school lunch program. Now, with the school garden in place, the students can continue being exposed to fresh foods with taste testing provided during gardening classes, in the cafeteria, or as a special snack in class.

Although the garden is being utilized to expose students to different types of fresh food, the main purpose of teaching in the garden is to provide hands-on experiences for students while still meeting academic standards. The garden is being used to teach science, math, and reading. Mr. Hilton believes that meeting science standards through the use of a school garden, as an instructional tool, is more effective than the exclusive use of a traditional textbook approach. Students are experiencing the garden first-hand and engaging all of their senses, which can lead to meaningful learning. He is hopeful that, as teachers engage their students in garden-based learning activities, they can serve as an example to other teachers of how successful and rewarding this experience can be for the students. For this building administrator, a school garden is an extension to the classroom and can be utilized to enhance student learning.

Ms. Hegmann, the FoodCorps service member, has played a major role in developing curriculum to meet various grade-level goals. When working with the garden committee and teachers to develop lessons for the garden, Ms. Hegmann considered the following question, "Why are we building the garden?" With this in mind the following goals were identified:

- Food production at the single class level.
- The garden is not meant to feed the entire class or school, but instead to expose students to different food.
- Provide a hands-on, real world space to take on real world problems and problem solving.
- Teach about careers in farming and agriculture.

- Teach about Native Americans using traditional Native gardening practices.

Photo 16 shows an example of how the garden has been used to teach using a multidisciplinary approach. The students painted pictures of the Three Sisters Garden, and included a poem depicting what the garden meant to them. The Three Sisters Garden is planted to teach students about the Native American tradition of companion planting the three crops of corn, beans, and squash, as well as the importance of sustainable agriculture. Writing the poem also included the use of cursive, which provides additional practice to further develop handwriting skills, and taught students how aesthetics can be important when displaying artwork.



Photo 16. Three Sisters Garden and Student Artwork.

Another example of using the school garden to meet grade-level goals is the third grade Pizza Garden (see Photo 17). The raised bed for the Pizza Garden was specifically designed in the shape of a hexagon to allow students to practice math standards while working in the garden. The theme of a pizza garden includes marking the raised bed off into wedges, like a pizza, for planting. Students planted vegetables that are commonly

found in pizza sauce or used as a pizza topping, such as tomatoes, basil and peppers. At harvest time, the students make pizzas together as a class.



Photo 17. Third Grade Pizza Garden

In addition to meeting academic standards, working in the garden is meant to teach the students' behavioral and social skills such as following directions, sharing, respect, team building, and working for a common purpose.

Mrs. Hubner, a third grade teacher, described how her class has utilized the garden. With curriculum designed by Ms. Hegmann, the third graders were able to cover science standards with hands-on activities during a 10-week unit using the school garden. The weekly lessons, led by Ms. Hegmann, covered topics on plant reproduction, plant parts, food webs, and decomposers. Mrs. Hubner noticed the positive benefits of using the garden as a supplemental tool in place of the traditional classroom/textbook method:

> "They think it's great and they're able to understand it better being able to see it"
>
> "They understand the content better"
>
> "They make better connections between the cycles"
> "Just the vocabulary, using it out in the garden as opposed to just in the classroom seems to help, too"
> "I think it's great for the kids".

With no personal experience gardening, teachers like Mrs. Hubner, who enjoy getting their students outside and involved in hands-on activities, really benefit from the assistance of Ms. Hegmann, who has extensive knowledge of gardening and dedicated time for developing garden-based lessons. Ms. Hubner expresses how important it is to her to have someone like Ms. Hegmann to work with.

> "I think having somebody here to do things with our kids will make it more useful (the garden). If we don't have that person, I still see us using it, but maybe not as much as we do right now".

Challenges and Successes Associated With the School Garden: Due to the generous amount of research and planning that went into the design and development of this school garden, there have been very few challenges associated with the school garden thus far. One initial challenge during the planning stages was developing a plan to address the rocky soil that exists in this region. In the very early stages of planning it was determined that the soil here was too heavily laden with large boulders to make soil remediation a viable option. This led to the design of raised beds for the school garden. Another challenge in the first few weeks was the lack of proper irrigation. During the spring and early summer, the garden had to be hand watered daily to ensure the health of the seedlings and small plants. Later, proper irrigation was installed to allow a timed watering system to be utilized. In anticipation of deer being a nuisance in the garden, a fence was installed to enclose all thirteen raised beds.

Ms. Hegmann provided sound advice to anyone planning a school garden with the suggestion, "Do your research first. So many problems are avoided by reading books

first." This is evident in the following list of the many attributes of a successful garden program that were described by the participants involved in this school garden study.

- There is a strong committee of dedicated people that consists of community members and parents.
- The committee is goal oriented and meets regularly.
- A schedule is provided by the FoodCorps service member to help teachers organize their garden activities.
- Teacher training is provided by the school.
- The community, school board, school personnel, and non-profit groups all come together to support the school garden.
- The garden provides a prime opportunity to teach about sustainability, farming, agriculture as their livelihood, social development, and the community working together.
- Benefits: hands-on, the students have a better understanding of the content, they are able to comprehend the vocabulary better, kids are exposed to new types of food that they have never seen before, they get excited about picking and eating food right in the garden, many tried kale for the first time.
- "We love it, and think it's great" (Hubner).

Future Plans: The many supporters of this school garden are working towards future plans, which include securing funds for continued teacher support. Ms. Hegmann has played an important role in developing curriculum and providing support for the

teachers, but unfortunately, her two-year term as a FoodCorps service member will come to an end in July of 2013. Mrs. Dochnahl, of MF2F, shares future plans to apply for another Food Corp member for 1-2 years, and then hopes to have the school hire a part-time garden coordinator as a permanent position. The primary responsibilities for the person in this position would be to continue to develop curriculum and work with teachers and students in the garden. If created, the additional support provided by this position will help to ensure the sustainability of the garden program going forward.

Mr. Hilton shared his future plans for the school garden as well. Included in his long-term goals is the prospect of using the school garden for adult education courses. The school district already offers adult education classes on gardening, harvesting, and canning, and Mr. Hilton would like to expand the course offering by using the new school garden as an additional resource to service the community. He would also like to see the installation of a greenhouse to expand the growing season and allow the students of his school to participate in hands-on learning activities year-round.

## Meaningful Learning Theory

The first question investigated in this research study was: *How do the three facets of Meaningful Learning Theory—Thinking, Feeling, and Acting—help explain school gardens at three schools in Southwest Montana?* Many of the activities that take place in a school garden incorporate one, or all three, facets of Meaningful Learning Theory, thinking, feeling, and acting. The activities that take place in and around a school garden, whether it is students exploring the garden during recess or observing a plant during a

garden-based science lesson, can, and often does, integrate elements of cognitive, emotional, and physical development. Table 8 illustrates specific examples of how Meaningful Learning Theory is evident in school gardens, and the impact of these activities on the development of students.

Hyalite Elementary School uses their school garden to teach students about plants, food systems, living things, academic standards, and social/behavioral skills. When evaluating these topics in the context of thinking, or cognitive development, the students are gaining new knowledge about the parts of a plant and the ways we grow, harvest, prepare and consume food, such as a radish, by applying a new experience to their prior knowledge. Perhaps a child has seen a radish on a salad or in the produce section of a grocery store, but now they have first-hand experience with planting the seed, nurturing the plant, pulling the radish out of the soil and eating the food with their peers. This combination of experiences makes the acquisition of knowledge about plants and food more meaningful and permanent.

The same effect is seen at Sleeping Giant Middle School and Ennis Schools K-8. At SGMS the students learn not only about how food is grown, but how food is grown in Montana. By incorporating place-based lessons, the new content knowledge is made more relevant to the students, which allows them an additional context for associating the knowledge with prior experiences.

At all three schools, we see a similar theme being taught, seed → plant and seed → food. The three school garden sites all stated that the student's plant seeds. The students are also involved in nurturing and maintaining the garden during the growing

season (seed → plant). Students harvest food from the garden and taste the food they have taken part in growing (seed → food). "They can see the whole cycle"(C. O'Shea).

The students in Ennis are acquiring knowledge in science, food systems and behavioral skills. In addition to these topics, the school garden is being integrated across the curriculum into the subjects of math, art, social studies, and other areas. The students of this small town are also witnessing the benefit of building community, and working together for the common good.

The second facet of Meaningful Learning Theory is Feeling. Evidence of feeling (affective development) was both observed and reported by the interview participants. While taking part in garden-based activities as a participant observer, I observed students smiling, laughing, and making positive statements about the garden activity. The interviewees repeatedly made comments like, "the kids get so excited" and "they get excited about picking and eating food right in the garden". This provides supporting evidence of a school garden being an effective tool for teaching children. In education today, there is much talk of the importance of engagement, differentiation, and making learning relevant and meaningful to the learner. Based on the display of excitement, feeling of pride, and increase in engagement, that was both observed by myself and described by garden participants I would conclude that a garden program can be a successful and valuable asset to the school.

In addition to having positive feelings about hands-on gardening experiences, the students and teachers are *Acting* in the garden, engaging in a task or physical activity. Working outside in a garden provides direct experiences with nature, and a number of

senses are engaged at once; sight, sound, touch, smell, and even taste are incorporated into the activities. In the simple act of harvesting and eating a carrot straight from the garden, a student can hear the insects buzzing, birds chirping, and peers laughing, they can smell the soil and fresh air, feel the dirt and the texture of the plant, and then finally taste the fruits (or vegetables) of their labor. The more senses that are engaged during a learning experience, the more permanent and meaningful the learning becomes. In all three of the school gardens in this study, the students were given opportunities to plant seeds, dig in the dirt, water and care for plants, harvest, taste test, eat with friends and teachers, and make observations of the cycles that exist in nature.

## Motivations and Activities of Key Participants

This section addresses the second research question: *What are the motivations and activities of key participants (teachers, government organizations, school principals, and community members) related to the success of the school gardens at the three study sites?* Each school garden site is supported by people with varying levels of vested interest in the success of the school garden programs.

Government agencies have a presence at each site as evidenced by the sponsorship of two FoodCorps service members and an AmeriCorps VISTA. These three people have similar backgrounds, each with gardening experience, working as volunteers, and choosing careers that serve communities in need.

Table 8: Quotes indicating the impact of school gardens explained through the three principles of Meaningful Learning Theory

| The Impact of School Gardens | | | |
|---|---|---|---|
| | Hyalite Elementary | Sleeping Giant Middle School | Ennis Schools K-8 |
| Thinking | "teaching the kids about respect and responsibility"<br><br>"kids are learning about living things…"<br><br>"bees are pollinators, and they're going from plant to plant…"<br><br>"what happens to a plant when it dies … they can see the whole cycle".<br><br>"explaining to them about how the thistle is kind of taking over…" | "they have an understanding of what it means to garden and what plants require and they know that you have to be delicate…"<br><br>"so what grows in Montana?"<br><br>"I'm trying to teach them about their individual food systems … the nutritional value of it and how it grows in Montana and who's producing it".<br><br>"seed to plant, seed to food" | "They learn about planting, sustainability, fresh food…"<br><br>"Students also use the garden at the end of the season to learn about composting, wind erosion, and how to get the garden ready for winter".<br><br>"kids are exposed to new types of food that they have never seen before"<br><br>"Building community" |
| Feeling | "The kids get so excited"<br><br>"It makes teaching fun. And the kids love it".<br><br>"the excitement that kids have, you can kind of see it in the lessons"<br><br>"there is a heightened sense of engagement"<br><br>"they're very empathetic"<br><br>"I just like teaching outside". | "The garden is awesome and it's really fun"<br><br>"the thing that I love about gardening…"<br><br>"students are proud of their work"<br><br>"they have an attachment to the garden"<br><br>"students need to demand better options" | "it's fun to watch the birds come in for sunflowers"<br><br>"The community really enjoys the garden…..comment on how much they love the garden …. it is beautiful".<br><br>"these teachers are so excited about this program"<br><br>"they get excited about picking and eating food right in the garden" |
| Acting | "Planted flowers with her students"<br><br>"we just went out there today to water it, just to make sure it's growing"<br><br>"kids are working on thinning the radishes"<br><br>"they plan to bring in a grill and cook some of the veggies with the students"<br><br>"cut some leaves, and have them all taste it (lettuce)" | "harvesting with the seventh graders"<br><br>"actually going out and planting together"<br><br>"controlled experiments"<br><br>"When students visit the farm they will eat anything, even cabbage worms!, when they see it coming out of the ground, they have to see it"<br><br>"they do go out and they try arugula and they try different things that are growing" | "Local chefs come to the school and cook for the kids"<br><br>"taste testing with students"<br><br>"tasting new vegetables at school"<br><br>"we made a kale salad"<br><br>"3rd graders plant the corn and harvest it as 4th graders"<br><br>"students start wondering into the garden, they are curious… kids join in to taste the parsley" |

Each of these women agreed continue their employment for an additional year beyond their original commitment to see the garden projects come to fruition. Additionally, each has worked to increase the amount of garden-based activities available to students at the garden sites.

Ms. Jackson (FoodCorps, Hyalite) works with teachers to develop nutrition and garden-based lessons that are appropriate for each grade level. Through my participation in garden related events in the community, I have observed Ms. Jacksons efforts in developing working relationships with community groups that can further support the Hyalite school garden. She has attended meetings of various non-profit groups that support local food procurement, farming, and gardens, attended teacher training workshops, invited outside parties to attend a garden committee meeting at Hyalite Elementary School, and volunteered at community events. These activities are evidence Ms. Jackson's commitment has gone to maintaining a successful school garden program at Hyalite Elementary School.

Ms. Williams (AmeriCorps, SGMS) has worked to increase the opportunities available to students for hands-on learning and growing food. During her one-year appointment, Ms. Williams received funding from the NCAT and charitable donations from a variety of sources. These funds will be used to expand the existing garden at SGMS, as well as provide additional garden space at other area schools. Her motivation for participating in grant writing and soliciting donations from the community is to "increase local foods in the schools". There are many examples of Ms. Williams participating in activities that provide fresh/local food to students. According to her:

> "Any extra food (from the garden) is donated to the central kitchen, the High school has a new kitchen with equipment to process the garden fresh food, they do a lot of from scratch cooking"

> "The 100 percent local meal (event) at the end of October is really interesting for kids to see that it is still possible in Montana, even though it's cold."

Ms. Williams has also agreed to say on a second year, working for AmeriCorps as a VISTA in Livingston.

In Ennis, Ms. Hegmann (FoodCorps) is motivated by gardening and has stated, "the purpose of the garden is to provide kids with hands-on opportunities and get kids outside." She has worked for the past two years to design, implement, and maintain the school garden program in Ennis. Ms. Hegmann has also conducted regular garden committee meetings to ensure continued interest and involvement from people in the community. In addition to ensuring continued community support of the garden, Ms. Hegmann has worked with classroom teachers to design lessons that will effectively meet their curricular needs and align with state education standards (http://opi.mt.gov/Curriculum/CSI/index.html#gpm1_2).

Teachers in this study also participated in numerous activities that contributed to the success of their school garden programs. Mrs. O'Shea's motivation for working in the school garden stemmed from her desire to connect children to nature and increase the amount of time they spend outdoors. The following quotes represent her motivation and the actions she has taken to expose students to nature.

> "I try and take them out to the riparian area once a week, at least…"

> "Once a week I'm taking them outside, whether it's over to the garden plot or to the riparian area"

"I just like teaching outside".

> "Deb and I had to do a community service project, so our project was creating an outdoor classroom".

My observations of Mr. Pettit (SGMS) teaching in the garden provided evidence of his desire and activities designed to provide hands-on learning experiences for his students. Through the use of humor, enthusiasm, and creativity, Mr. Pettit was able to make the 30-minute garden lesson (see previous description p. 100) interesting and interactive. Students had an opportunity to engage all of their senses sight, sound, smell, touch, and taste in the experience of the garden site.

Mrs. Hubner (Ennis) also uses the school garden to teach hands-on science to her students. With the help of Ms. Hegmann, she has used the garden as an extension of the classroom. On her class webpage, Mrs. Hubner has posted photos of her students enjoying carrots that they have harvested from their school garden. "And they really like being able to pick things and being able to eat it right there, like carrots. They're very excited about that." Mrs. Hubner believes that her students benefit from learning in this alternative setting because they can interact, engage with content and have positive feelings about learning.

The building administrators at each garden case study site shared their motivations as well. The most common motivation for supporting a school garden program among the administrators was providing hands-on learning experiences for the students.

> "…any of those hands on activities that you can do, it definitely heightens the engagement, as does getting them outside the building walls and

> getting them into the outdoors and making that connection"(Van Vuren, Hyalite)
>
> "I think the more hands on the kids can get in their whatever the topic is, the subject, or content area, the better…"(Rosberg, SGMS)
>
> "Kids remember better by using all of their senses, it doesn't end with the garden, but extends into the whole valley"(Hilton, Ennis)

The positive motivation, enthusiasm and commitment of the building administrators at each garden site are demonstrated through their endorsement of the existing garden programs, financial support through allocating existing school funds, supporting teachers continuing education efforts, and looking into the future for potential growth of their school garden programs.

## The Evolution of Three School Gardens

The past, present, and potential future of the three school gardens was addressed in the third research question, *From the perspective of the adults involved at each garden site, how have the three school gardens evolved over time?* During the course of this research study each of the site participants shared stories of the origins of the school gardens. Photographic evidence of the various stages of the garden was also evaluated to provide a visual timeline of planting, plant growth, and harvest times (Table 9). Many of the interviewees also discussed the future goals of the school garden programs.

Table 9. Timeline of the SGMS Garden.

| Spring | Fall | Winter |
|---|---|---|
|  |  |  |

Hyalite Elementary School garden has been a part of the school ground landscape since the school opened in 2009. Use of the school garden is voluntary for teachers and students and participation varies from year to year. With the addition of a FoodCorps service employee during the 2012 school year, the number of students learning in the garden has increased. Ms. Jackson will be staying in her position at Hyalite for the 2013 school year to help implement some of the future plans, which include expanding the amount of garden space, extending the growing season, and incorporating the natural playground to allow students more informal learning opportunities.

Sleeping Giant Middle School garden was installed in the spring of 2012 with the help of Mr. Pettit's seventh grade science students. He planned to use the garden to provide hands-on learning opportunities to his students. With the help of Ms. Williams the school garden has been utilized by other grade levels and as a resource for meeting Farm to School curriculum standards. Ms. Williams has also received funding that will be used to expand the garden space. This will allow more students to participate in garden-based learning activities, as well as increase food production. The school garden program has been such a success at SGMS that plans are underway to install a garden program at another school in the area.



Photo 18. Mr. Pettit Teaching in the School Garden.

The school garden in Ennis was installed in the spring of 2012 after a great deal of planning by community members and volunteers. The installation was efficient and focused and took one single day. The garden included several themed garden beds. Initially the garden was going to be installed in two separate phases, but with unanticipated additional contributions the school was able to install the entire garden in the first year. Ms. Hegmann, volunteers and several classroom teachers support the garden activities and maintenance. According to the evidence collected the future plans for the school garden program include continued professional development, a garden coordinator, adult continuing education classes, and the addition of a greenhouse.

Overall the three garden sites in this study are exemplar programs in the context of the Northern Rockies, Greater Yellowstone Ecosystem and state of Montana. The integration of community members in the school, the dedication of several teachers, the support of government employees and the positive oversight of administrators combine to produce experiences for students that integrate content, skills and positive affective outcomes.

# CHAPTER 5

# CONCLUSION AND RECOMMENDATIONS

The purpose of this study was to describe three school garden sites in the Greater Yellowstone Ecosystem in Southwest Montana in terms of ecological and social contexts. In Chapter One, the contextual framework for the study was established by providing examples of the school garden ecological and social factors and how Meaningful Learning Theory might help explain garden related educational activities. An explanation of the region, climate, and landscape was also provided, in order to further explain some of the challenges that may be faced by the school garden programs in this study. Meaningful Learning Theory is the theoretical framework upon which the study was designed, and it is used to explain the impact and successes of many of the activities that take place at these school gardens. The three principles of Meaningful Learning Theory, Thinking, Feeling, and Acting, are integral to outdoor education and garden-based learning.

In Chapter Two, the literature review synthesized the findings of existing publications, providing evidence supportive of the importance of Meaningful Learning Theory, and the ways in which it can be applied in order to better understand the use of school gardens as a tool for teaching and learning. The literature also reports the diverse uses, successes, and difficulties with creating, maintaining, and teaching in a garden-based learning environment.

Chapter Three explains the qualitative research methodologies and data acquisition methods used in the collection and analysis of the data. Also included in this chapter is an explanation of the selection process for each case study site, and the interview participants.

In Chapter Four, an analysis of the qualitative data collected from interviews, published materials, photographs, and other online sources was presented to describe and explain each school garden case study. A description of the geographic location, school, and garden site provides the context in which each garden was developed, and the ways that each garden is being used during the study. Each school garden was characterized by both unique and common purposes, and themes revealed in the analysis of interview transcripts and field notes.

This chapter focuses on a synthesis of the results of the data analysis for each case study. Recommendations of essential elements to a successful school garden program will be discussed, as well as suggested reading, and areas of future research.

## The Purpose and Use of a School Garden

The culture and the community in which each garden exists impacted each of the schools in this study. These influences ranged from an emphasis on agriculture, place-based education, connecting children to the environment, to nutrition education. After evaluating several locations in Southwest Montana, three sites were chosen for this study. Common attributes, which influenced the selection of sites were that the school gardens considered were relatively new, constructed within the last three years, and community

stakeholders were still in the process of discovering the best ways to utilize the school garden to meet the needs of the teachers and students. One contrasting principle became evident during this study: school gardens differ in purpose, scale, and use, and they are not a "one size fits all" entity. The first research question investigated: *How do the three facets of Meaningful Learning Theory—Thinking, Feeling, and Acting—help explain school gardens at three schools in Southwest Montana?* Despite the fact that each school garden was unique in character, size, and function, the three principles of Meaningful Learning Theory were common across numerous events described by the interview participants and are summarized here.

The garden at Hyalite Elementary School consisted of raised beds that had been incorporated as a permanent part of the schoolyard. The school was designed around the motto "No Child Left Inside," and places an emphasis on connecting children to nature and increasing the time students spend learning in the outdoors. In addition to being focused on connecting students to the environment, other themes at this site involved teaching gardening and nutrition. This school's dedication to providing outdoor opportunities is evident in its recent development of a riparian area used as an outdoor classroom, and the installation of a natural playground. The addition of these elements enhances the functionality of the existing school garden by integrating the outdoor theme throughout the curriculum, as well as in play. Here, students are using the garden to learn both academic and social skills. This is accomplished through hands-on activities presented by the classroom teachers and the FoodCorps service member, which include digging, planting, observing, cooking, eating and many others. The direct experiences

provided to these students resulted in not only teaching students a skill, but also increased engagement, curiosity, and excitement about learning in the garden.

Although the primary use of the school garden at Sleeping Giant Middle School differs from that of Hyalite Elementary, the impact of Meaningful Learning Theory is still evident in the learning outcomes and positive attitudes of the students and teachers that utilize this alternative teaching tool. At SGMS, the participants have a great deal of influence in determining the purpose and use of the school garden. Mr. Pettit, the seventh grade science teacher, is passionate about providing both place-based and experiential learning opportunities for his students. His enthusiasm for providing all three facets of Meaning Learning Theory extends beyond the typical classroom tools of textbooks, and includes many hands-on experiences through the use of a greenhouse, aeroponics tower, hydroponics table, and five raised garden beds. Students are taught science standards through the use of this specialized equipment, which allows students to learn by seeing and doing, which in turn leads to more meaningful learning.

The other prominent theme associated with the use of this school garden is locally grown, fresh food. Ms. Williams, the AmeriCorps VISTA, frequently uses the school garden to teach Farm to School lessons, with focal points of her curriculum being local agriculture, fresh foods, and nutrition. By utilizing the school garden, students were able to participate directly in the planting, nurturing, and harvesting of foods that can be grown in their local area. The students are also provided an opportunity to expand on this knowledge of local food systems by visiting a nearby farm to see how food is grown on a larger scale. Taking part in farm field trips, and growing food in the school garden, has

exposed students to a variety of vegetables and resulted in students tasting and eating a larger variety of healthy foods.

Consisting of thirteen raised beds, the school garden at Ennis School K-8 is the largest garden in this study. Resulting from the opportunity for new construction and a large amount of community support, this school was able to allocate a large amount of space for the school garden. Landscaping for a new school building had not yet been installed and the school board chose to implement a school garden instead. In constructing the garden, aesthetics were a major consideration in both design and building materials. This garden, located at one of the main entrances to the building, is intended to be a permanent fixture of the school grounds. In addition to raised beds—necessary due to the rocky soil—the garden area is also adorned with decorative gates, colorful signs, and a perennial flower garden.

The themes that emerged in the data analysis for Ennis Schools K-8 were the commitment to community, local food systems, and garden curriculum specific to each grade level. Commitment to community was evident in the widespread support that was provided to make the planning and installation of the garden possible, and in the plans to use the school garden to serve the community by providing adult education classes and summer camps for students.

Ms. Hegmann, the FoodCorps service member, has been working to develop garden-based lessons that focus on both local food systems and grade level appropriate curriculum. The students have used the garden to learn about working together towards a common goal, how to plant seeds, when to harvest vegetables, science skills, math

applications, and even poetry. All of this knowledge is gained in and outside of the classroom, with the garden helping to enhance the learning and make it more meaningful. The community, teachers, and students, are excited about the new garden and the benefits that it brings to their community. Meaningful Learning Theory can be used to explain elements (thinking, feeling, acting) of school garden sites across cases. This study suggests that future research, curriculum, and education activities at school garden sites can use Meaningful Learning Theory for design, implementation and assessment.

## Motivations of Key Participants

Despite the differences that exist in theme or overall purpose for these three school gardens, in each case having a dedicated group of supporters is critical for the long-term success of a garden-based program. The second research question: *What are motivations and activities of key participants (teachers, government organizations, school principals, and community members) related to the success of the school gardens at the three study sites* explores the ways in which the life experiences, passions, or training of the participants help contribute to the success of each school garden. Each of the three case study sites has a number of people involved in using, maintaining and supporting the school garden.

For this study, community members were identified and asked to participate based on their level of involvement in the school garden program. Many of the participants (teachers, government employees, administrators) contribute beyond the essential requirements of their employment. The individuals that work directly in these gardens

have a passion for working with students in a hands-on, experiential capacity. Mr. Pettit is motivated by the success of his students and enjoys providing them with place-based activities to demonstrate the ways that the science content is tied directly to their daily lives and the place they call home. His colleagues at Sleeping Giant Middle School describe Mr. Pettit as a "go-getter" and a "man that get things done."

The teachers at Ennis Schools K-8 and Hyalite Elementary have attended teacher training workshops and conferences to acquire the skills and knowledge necessary for teaching students in an outdoor classroom. This additional training involves the commitment of additional time outside of the regular school day. These teachers have proven to be willing to go the extra mile to provide their students with a more meaningful learning experience.

Both the administrators and the teachers interviewed for this study were motivated by the positive attitudes and academic success that was evident in their students when they participated in garden-based learning activities. The administrators from all three case study sites placed a heavy emphasis on the importance of providing students with hands-on learning experiences. They believed this to be a more effective and rewarding method of teaching, and described students as having a higher level of engagement and excitement when learning in the garden. As a result, the administrators support the use of a school garden as an instructional tool and consider the garden an extension of the classroom. The principals at each school have supported their garden in some or all of the following capacities providing teacher training, securing outside

funding, providing a garden coordinator for additional teacher support, agreeing to future plans for growth or expansion of the school garden program.

In addition to teachers, administrators, and FoodCorps service members, AmeriCorps VISTA and numerous community members support the school garden programs. These participants shared a common goal of teaching children about their local food system, where their food comes from, and why healthy eating habits are important.

The community members interviewed for this study were motivated by their own passion for sustainable agriculture and felt strongly about educating children on this subject. Within the context of sustainable agriculture, these community members provided hands-on experiences for students, teaching them about growing food, trying new things, and supporting the local economy through the use of their farms, greenhouses, and local farmers market.

The FoodCorps service members and AmeriCorps VISTA in this study devoted their time to working within a government agency, with the primary mission of teaching children about nutrition and healthy food. All three of these participants have a background working in agriculture, gardening, or community service, as well as a history of wanting to serve communities and help develop lasting programs to better the lives of the students they service. As reported in Chapter 4 community service is obvious in the programs they have developed, the weekend events they have hosted, and their efforts of reaching out to the community to secure support for each school garden in this study.

## Positive Outcomes and Evolution of Three School Gardens

Through the analysis of my observations, field notes, video recordings, photographs and interview transcripts, many positive outcomes of the school gardens in this study were identified. The positive outcomes of three school gardens was investigated through the third research question, *From the perspective of the adults involved at each garden site, how have the three school gardens evolved over time?*

The most noticeable, and frequently mentioned, impact the school garden has had on students who participate in garden-based learning activities is a heightened level of engagement and excitement about learning in the garden (affect, feelings). The administrators of all three case study sites emphasized the importance of providing hands-on experiences for students, and identified the garden as a method of experiential learning (psycho-motor, acting). Ms. Rosberg, the principal of SGMS, also stated that she thinks a school garden has value because it can be utilized to provide students with hands-on learning experiences. She believed that the more opportunities students have to engage in hands-on activities the better, regardless of the subject, topic, or content area. She also noticed that the students have an emotional attachment to the garden, and take pride in the work that is done there. Mr. Van Vuren described the excitement that he sees in the children when they participate in garden activities:

> It's the excitement that kids have, you can kind of see it in the lessons, when they're out there in the garden and they bring that product into their classroom, and they either taste it, or work with it, or manipulate it, there is a heightened sense of engagement with that.

The teachers described the emotional impact that working in the garden has had on their students, and this was most often described as excitement or a love of gardening. Ms. Hubner shared with me the fact that her students enjoy being able to go out to the garden, pick fresh food and eat it right there. She described this as being very exciting for the students. Mrs. O'Shea provided me with similar examples; she explained how excited her students are when they have an opportunity to plant and watch things grow in the garden. She loves teaching in the outdoors as much as possible, because it is fun for her, and the students get so excited about learning.

## Essential Elements: Recommendations For a Successful School Garden

The school gardens in this study demonstrated the ways in which a garden program can benefit students academically, socially, physically, and emotionally. This is only accomplished with hard work and a number of dedicated people. From the data analysis of interview transcripts and field notes, a number of elements were identified as being essential to the success of a school garden program. Inclusion of these elements helped overcome some of the challenges that the school gardens in this study experienced.

### Supporters

Before breaking ground on a school garden, it is important to assess the level of interest among the school's staff, building administrators, parents, and community members. Additionally, recruiting support from outside agencies can be just as important

as recruiting from within the school and the community. Classroom teachers have a great deal of demands placed on them, and securing volunteers, committee members, and ideally a garden coordinator can provide the additional support that teachers need to make the most of a garden-based learning program.

Planning

Once the supporters for the garden project have been identified, planning can begin. Identifying the purpose of a school garden is the first step in planning. This can help determine the size, design, and function of the physical space. Many questions need to be addressed, such as how many students will be in the garden at any one time? Do you need to create shade or seating areas? Is there an existing water supply that can be used?

Also, stakeholders should consider the ways that the garden will enhance the curriculum and align with education standards. There are a number of resources available, for both parents and teachers, on methods for incorporating gardening into the academic standards. Utilizing the school garden as a tool to teach curriculum will not only enhance students' learning outcomes, but will help increase the support of stakeholders by giving purpose to your program.

Financial Considerations

Funding is another important element that is critical to the success of a school garden. Determining a budget for the preparation, installation, materials, and gardening supplies is just the first step. It is also important to have a plan in place for securing

funding for the continued maintenance of the garden. This can be accomplished through charitable contributions from local agencies, grant funding, parent organizations, and monies allocated through general funds of the school. The following items should all be considered when designing a budget for a school garden:

- Teacher training workshops
- Part-time garden coordinator
- Garden shed, shovels, gloves, hoses, seeds, soil
- Building materials for seating, shade areas, fences, gates, signs, raised beds, and walkways

Maintenance

When identifying supporters, planning, and securing funds, the individual(s) who will be responsible for maintaining the garden should also be identified. During the school year, students, parent volunteers, teachers, afterschool clubs, or the school's janitorial staff or grounds keeper may all contribute to the maintenance of the garden. Another important aspect of maintenance is determining those who will be using the space, how often they will be utilizing the garden, and whether they will be planting, weeding, watering, and harvesting. Determining a schedule for garden use can eliminate many potential maintenance problems. There is nothing worse than seeing plants dry up or having vegetables die on the vine because there was no plan in place for scheduled maintenance. The summer months can be an especially trying season for a school garden. A timed drip system is a watering technique that can save volunteers a great deal of time and keep a garden alive during this challenging time. There are several avenues that can

be considered when searching for people who will maintain the garden during the critical summer months:

- Summer camps or gardening clubs
- Volunteers or families from your school or surrounding neighborhood
- Summer interns: high school students, college students, Master gardeners
- A paid part-time gardener

Whatever method is chosen to best fit the needs of your school garden; it is vital to establish a consistent schedule for watering. And make sure to reward those involved by allowing them to reap the benefits of helping out by taking home their share of fresh produce.

Additional Resources

Included in Appendix I is a school garden checklist produced by E2 Evaluation (2012). I have found this instrument to very versatile and easily modified to meet a variety of needs. This checklist is a great starting point when planning; it can be used in determining the elements that are necessary for the selected site, for creating a budget, and it can also be a great tool for presenting a garden proposal to the school board or building administrator.

Recommended Reading

*Getting Started: A Guide for Creating School Gardens as Outdoor Classrooms*. A free pdf Download is available at Lifelab.org, Curriculum & Activity Guides.

http://www.lifelab.org/store/curriculum/#GS. This is a free guide and covers all of the essentials for starting a school garden program. Some of the topics covered include determining the purpose of the garden, realizing the importance of school staff and volunteers, and examples of potential curriculum.

*How to Grow a School Garden: A Complete Guide for Parents and Teachers* by Arden Bucklin-Sporer & Rachel Kathleen Pringle (2010). For a more in-depth explanation this 223-page book provides information and suggestions for building a school garden. The book contains many color photographs of innovative garden designs and ideas of how to incorporate materials, new and old, to build a functional garden space to meet the needs of any school site. This book provides a strong foundation for the development of garden programs and covers all of the essential elements necessary to build a successful program.

## Summary

The findings of this study support previous school garden research. Table 10 illustrates the common themes at the three school gardens and other school gardens in the United States. Many of the existing research studies on school gardens identified successes and challenges with school gardens. Other areas of similarity were the discussion of future plans, goals, or recommendations for a sustainable garden program, as well as connecting to nature.

In addition to supporting the themes of the current body of literature on garden-based learning, this study provides unique examples of three school gardens located in

the Greater Yellowstone Ecosystem in Southwest Montana. The location of these school garden sites sets them apart from many of the other gardens evaluated in previous studies.

This contribution will benefit those exploring the use of school gardens in areas with similar ecological and social contextual factors. The three facets of Meaningful Learning Theory (thinking, feeling, acting) were a valuable component of the garden activities observed and described in this study and provide examples of strategies that can be used in garden programs to promote effective teaching and learning.

From the methodological perspective, conducting research as a participant observer helped create valuable interpersonal relationships for me as a teacher educator-researcher. This approach fostered connected, embedded, and contextual results and conclusions through complex interactions taking place around garden related events. This process of research helps connect the researcher to the garden site participants and the community.

Limitations of the study are largely a function of limited time in a graduate teaching assistantship for field research. Assessment of student outcomes is an area for future study. More time at each case study site would allow for deeper connections and would promote a greater level of understanding of the political, social and ecological contexts that can shape the character of a school garden. Assessing student outcomes could help provide additional empirical qualitative and quantitative evidence of meaningful learning outcomes in school gardens.

Table 10. Alignment of Research Results with Current Body of Literature

| Themes Identified In Three School Gardens in Southwest Montana | Garden-based Learning Research (Appendix B) | How the Research Results Align With the Current Body of Literature |
|---|---|---|
| Challenges associated with a school garden. | 1, 3, 4, 5, 8 | 1 Perceived problems<br>3 Teachers need more training<br>4 Struggles at multiple sites<br>5 Teachers want support<br>8 Funding & materials |
| Successes associated with a school garden. | 1, 2, 3, 4, 9, 10, 12, 13 | 1 Moral development, pleasant experience<br>2 Community service<br>3 Achievement scores, behavioral improvement<br>4 Successful outcomes<br>9 Improved academics<br>10 Communication skills<br>12 Working towards a common goal<br>13 Strengthened community connections |
| Hands-on experiential education. | 7, 9 | 7 Project-based learning<br>9 Hands-on leads to higher performance |
| Using the school garden as a tool to teach standards-based curriculum. | 1. 9 | 1 Academic learning<br>9 Science standards |
| Teaching nutrition education. | 2 | 2 Health enhancement, developing healthy habits |
| Plans for future development and sustainability of the garden program. | 4, 11, 12 | 4 Resources for future development<br>11 Suggestions for future research<br>12 Recommendations to continue garden instruction |
| The adult participants have a high level of personal investment. | 2, 5 | 2 Dedicated teachers<br>5 Teachers expressed a high level of interest in gardening |
| There is a strong desire to connect children to nature. | 10, 12, 13 | 10 Environmental stewardship<br>12 Interconnection to the earth<br>13 Strengthened environmental connections |
| The presence of garden supporters. | 1, 8 | 1 Master gardener, parent/child/community interaction<br>8 Garden supporters are a necessary element |
| The importance of fresh and local foods. | | |

## Recommendations for Further Study

During this research study, several other areas of consideration were generated. Areas of research that could advance the discussion of school gardens include the following:

- The school gardens in this study had many supporters and demonstrated successful outcomes, however at each of the three case study sites there were many teachers that did not utilize the school gardens.

  What factors contributed to the lack of participation by some classroom teachers?
- The research questions and results of this study focused on the perspectives of the school administrators, teachers, community members, and government employees, but did not include the perspective of students involved in school garden activities.

  What motivates students to participate in garden activities? To what extent can Meaningful Learning Theory guide assessment of student outcomes?
- This study identified *connecting children to nature* as a dominant theme in one case study site. Further evidence is needed to determine the long-term impact of garden-based activities on students' attitudes about the environment, nature, and sustainability.

School gardens have been popular in the USA for approximately 25 years. School gardens are found throughout the USA. We all know school gardens are an effective curriculum focus and help promote effective teaching and learning. Students like them too! However, the research literature about school gardens has not developed a clear

theoretical and empirical foundation to suggest meaningful learning outcomes especially related to national, state and local standards. The study contributes to the school garden literature, yet much more systematic study is necessary.

# REFERENCES

Alexander J., North, M.W., & Hendren, D.K. (1995). Master gardener classroom garden project: An evaluation of the benefits to children: *Children's Environment*, *12*(2). Retrieved from http://www.colorado.edu/journals/cye/12_2/index.htm

The Alliance for a Healthier Generation (2012). Case study: Engaging high school students in school garden activities. Retrieved from: http://www.healthiergeneration.org

Andrew (2005). Livingston, MT: Yellowstone River near Livingston, MT. Retrieved from http://www.city-data.com/picfilesv/picv13800.php

Blair, D. (2009). The child in the garden: An evaluative review of the benefits of school gardening. *The Journal of Environmental Education*, *40*(2), pp. 15-38.

Bloom, B.S., Engelhart, M.D., Furst, E.J., Hill, W.H., & Krathwohl, D.R. (1956). Taxonomy of educational objectives: The classification of educational goals; *Handbook 1, Cognitive Domain*. David McKay Company, Inc., NY.

Bloom's Taxonomy (n.d.). An interpretation of Bloom's taxonomy-learning domains. Retrieved from: http://www.businessballs.com/bloomstaxonomyoflearningdomains.htm

Caprio, J.M. & Fames, P. (n.d.). Climate of Montana. *Montana Interagency Plant Materials Handbook.* Retrieved from http://animalrangeextension.montana.edu/articles/forage/MIPMH-chptr-1.htm

Carroll, C. (2003). *Growing an educational garden at your school: A study of the Hawai'i experience*. Nature Talks Publications, Kaua'I Hawai'i.

Centers for Disease Control and Prevention. *School connectedness: Strategies for increasing protective factors among youth.* Atlanta, GA: U.S. Department of Health and Human Services; 2009. Retrieved from http://www.cdc.gov

Children's Museum of Bozeman. (2013). Retrieved from http://www.cmbozeman.org

Cohen, W. (n.d.). The impact of garden-based learning on student health and nutrition. *Garden-Based Learning Research Briefs*. Retrieved from www.csgn.org/research

Dobbs, K., Relf, D., & McDaniel, A. (1998). Survey on the needs of elementary education teachers to enhance the use of horticulture or gardening in the classroom. *HorTechnology, 8*(3), 1998.

Ennis Chamber of Commerce (n.d.(a)). Community, *Grassroots*. Retrieved from http://www.ennischamber.com/grass-roots.asp

Ennis Chamber of Commerce (n.d.(b)). Photo of Downtown Ennis, MT. Retrieved from http://www.ennischamber.com/index.asp

Facebook (February, 2013a). Chinese New Year. Retrieved from http://www.facebook.com/media/set/?set=a.447288078676223.103654.328146030590429&type=3

Facebook (February, 2013b). V is for Vegetable Soup. Retrieved from http://www.facebook.com/media/set/?set=a.447288078676223.103654.328146030590429&type=3

FoodCorps (2011a). About us. Retrieved from https://foodcorps.org/about

FoodCorps (2011b). Our Service Members. Retrieved from https://foodcorps.org/become-a-service-member/our-service-members/erin-jackson

Gay, L.R., Mills, G.E., & Airasian, P. (2009). *Educational research: Competencies for analysis and application* (9th ed.) New Jersey: Pearson.

Gaylie, V. (2011). *Roots and research in urban school gardens*. New York: Peter Lang.

Governor Schweitzer and First Lady's Math and Science Initiative (2010). Retrieved from http://www.mathscience.mt.gov/home.htm

Gowin, B.D. (1981). *Educating*. Cornell University Press, Ithaca, New York.

Greater Yellowstone Coalition (n.d.). Map of the greater Yellowstone ecosystem. Retrieved from: http://www.forwolves.org/ralph/gyemap.htm

Hazzard, E.L., Moreno, E., Beall, D.L., & Zidenberg-Cherr, S. (2011). Best practices models for implementing, sustaining, and using instructional school gardens in California. *Journal of Nutrition Education and Behavior*, *43*, pp. 409-413.

Hyalite Elementary School (2012). About Us. Retrieved from http://www.bsd7.org/hyalite/aboutus.php

Johnson, J. M., & Hurley, J. (2002). A future ecology of urban parks: Reconnecting nature and community in the landscapes of children. *Landscape Journal* 21, 110-115.

Kahn, P.H., & Kellert, S.R. (2002). *Children and nature: psychological, sociological, and evolutionary investigations.* Cambridge, MA: MIT Press.

Kaplan, R. & Kaplan, S. (1990). *Restorative experience: The healing power of nearby nature*. Cambridge, MA: MIT Press.

Klemmer, C.D., Waliczek, T.M., & Zajicek, J.M. (2005). Growing minds: the effects of a school gardening program on the science achievement of elementary students. *HortTechnology*, *15*(3), 448-452.

Kolb, D. A. (1984). *Experiential learning.* Englewood Cliffs, NJ: Prentice-Hall.

Kwak-Hefferan, E. (2012, May). Hiking makes you smarter. *Backpacker: The Outdoors at Your Doorstep,* pp. 72-84.

Learning Today (n.d.). Learning today Blog. Blooming orange: Bloom's Taxonomy helpful verbs poster. http://creativecommons.org/licenses/by-nc-sa/3.0/ Retrieved from http://blog.learningtoday.com/blog/bid/23376/Blooming-Orange-Bloom-s-Taxonomy-Helpful-Verbs-Poster

Life Lab Science Program. (1997). *Getting started*: *A guide for creating school gardens as outdoor classrooms.* Center for Ecoliteracy. Retrieved from http://www.lifelab.org

Louv, R. (2008). *Last child in the woods*. Chapel Hill, NC: Algonquin Books of Chapel Hill.

Madison Farm to Fork (n.d.). Projects, MF2F Geothermal Greenhouse. Retrieved from http://www.madisonfarmtofork.com/mf2f-geothermal-greenhouse.html

Maslow, A. H. (1968). *Toward a psychology of being*. New York: D. Van Nostrand Company.

Merriam, S. B. (2002). *Qualitative research in practice: Examples for discussion and Analysis*. San Francisco, CA: Jossey-Bass.

Montana Demographics (2012). Get Bozeman, MT demographics. Retrieved from http://montana-demographics.com/bozeman-demographics

Montana Department of Agriculture, (2011). Consumer home, ag facts: Montana's largest industry. Published: Fri., Oct. 14, 16:38:00 MDT, 2011. Retrieved from http://agr.mt.gov

Montana Office of Public Instruction (2012a). Curriculum & assessment: Science. Retrieved from http://opi.mt.gov/Curriculum/science/index.html

Montana Office of Public Instruction (2012b). School programs: School nutrition programs fresh fruit and vegetable program. Retrieved from http://opi.mt.gov/Programs/SchoolPrograms/School_Nutrition/

Montana Office of Public Instruction (2012c). OPI Reporting Center. *Free/Reduced Eligibility Data*. Retrieved from https://apps.opi.mt.gov/opireportingcenter/frmPublicReports.aspx?ProcName=procPublicReportingFreeReducedSelect&ScreenTitle=Free/Reduced%20Eligibility%20Data&SelectStateFy=1

Montana Official State Travel Site (2010). Livingston. Retrieved from http://visitmt.com/listing/categories_NET/City.aspx?siteid=1&city=livingston

Montana State University Department of Psychology. (2013). Photos of the Bozeman Area. *Aerial View of Bozeman.* Retrieved from http://www.montana.edu/wwwpy/photos.htm

Montana State University Extension (2012). Montana Climate Summary-By County. Retrieved from http://www.mtmastergardener.org/climate_data.html#Gallatin

Montana State University Office of Planning & Analysis (2012). Full and part time enrollment. Retrieved from http://www.montana.edu/opa/facts/quick.htm#Full

National Academic Press (2012). National science education standards. Retrieved From http://www.nap.edu/openbook.php?record_id=4962&page=1#

The National Center for Appropriate Technology (n.d.). Retrieved from http://www.ncat.org/index.php

National Farm to School Network, (n.d.). Retrieved from http://www.farmtoschool.org

Neville, T. (2010, August). Best towns 2010: Bozeman, Montana. *Outside*. 16.

Novak, J.D. (1977). *A Theory of Education*. Ithaca, NY: Cornell University Press.

Novak, J.D. (1998). *Learning, creating, and using knowledge: Concept maps as facilitative tools in schools and corporations*. Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.

Open Congress (2012). H.R.2054- No Child Left Inside Act of 2009. Retrieved from http://www.opencongress.org/bill/111-h2054/show

Patton, M.Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). Thousand Oaks CA: Sage.

Rosberg, L. (2012). Sleeping Giant Middle School. December Newsletter. Retrieved from http://www.livingston.k12.mt.us/site/default.aspx?PageType=3&ModuleInstanceID=676&ViewID=7b97f7ed-8e5e-4120-848f-a8b4987d588f&RenderLoc=0&FlexDataID=2347&PageID=1145

Schunk, D.H. (2008). *Learning theories: an educational perspective* (5th ed.). Upper Saddle River, New Jersey: Pearson Prentice Hall.

Smith, G.A., & Sobel, D. (2010). *Place- and community-based education in schools*. New York: Routledge.

Sobel, D. (2005). *Place-based education: Connecting classrooms & communities.* Great Barrington, MA: The Orion Society.

Stanionis, C.C. (2003). *Ecosystem management in the greater Yellowstone ecosystem: A coupling of human and natural systems.* (Masters Thesis) Retrieved from Montana State University, Bozeman

Stevenson, J. (2009, August). The best cities to raise an outdoor kid: The winning 25. *Backpacker Magazine,* 4.

Swinburne, B. (2008). Growing a new school community in a garden (Masters Thesis, College of Charleston). Available from ProQuest Dissertations and Thesis database (UMI No. 1450446).

United States Department of Agriculture (USDA), (n.d.). Agricultural Research Service, USDA plant hardiness zone map. Retrieved from http://planthardiness.ars.usda.gov

Warner, V.D. (2006). Finding common ground: Community garden as connector between culture, nature, and the individual (Masters Thesis, University of Texas at Arlington). Available from ProQuest Dissertation and Thesis database. (UMI No. 1433774).

Wolfe, P. (2010). *Brain matters: Translating research into classroom practice* (2nd ed.). Alexandria, VA: ASCD.

World Atlas Travel (2008). United States (by highest population density). Retrieved from http://www.worldatlas.com/aatlas/populations/usadensityh.htm

# APPENDICES

# APPENDIX A

## VEE ANALYSIS

## Research Questions

1. How do the three facets of Meaningful Learning Theory --- Thinking, Feeling, and Acting --- help explain school gardens at three schools in Southwest Montana?
2. What are motivations and activities of key participants (teachers, government organizations, school principals, and community members) related to the school garden success at the three study sites?
3. From the perspective of the adults involved at each garden site, how have the three school gardens evolved over time?

### Philosophy
- Science Education
- Environmental Education
  - Sustainability
- Nutrition Education
  - Healthy Living

### Theory
- Meaningful Learning (Thinking, Feeling, Acting)
- Experiential Education
- Place-based Education

### Principles
- School gardens can be used to teach Montana Standards.
- Children get a hands-on experience when designing, planting, tending, and harvesting in the garden.
- Interdisciplinary lessons are taught in a school garden with lessons focused on a variety of subjects such as, social studies, math, science, and art.
- Case study research methodology

### Concepts

| | | | | | |
|---|---|---|---|---|---|
| Thinking | School | Climate | Montana | FoodCorps | Science |
| Feeling | Standards | Seasons | Agriculture | Farming | Plants |
| Acting | Interdisciplinary | Elevation | Rural | Local | Seeds |
| | | Snowfall | Population | Sustainable | Soil |
| | Experiential | | Culture | Environment | Nutrition |
| | Hands-on | | | | Health |
| | Place-based | | | | Vegetables |

### Value Claims
Teachers and students are able to create shared meaning of various content areas while also developing a sense of place and environmental stewardship, from the unique experience of working in a school garden.

### Knowledge Claims
Planning, nurturing and harvesting incorporate place-based knowledge as well as hands-on experience for students. Exposing kids to nature and the environment is important to the people involved in school gardens.

### Transformation

| Questions | Interview | Journal | Photos |
|---|---|---|---|
| Q1 | x | x | x |
| Q2 | x | x | |
| Q3 | x | x | |

HyperRESEARCH will be used to analyze all interview transcripts and other data materials. Emergent themes will be identified and used to answer the four research questions.

### Data
Interviews: Four participants were selected from each case study site, one teacher, a government agent, community member, and the principal. Each was interviewed about the history and use of the school garden at their site.
Field Journal: The researcher kept a journal during all garden based activities. Journal entries include a description of sights, sounds, conversations, comments, and emotions.
Photos: Photographs of all three garden sites were used to capture greater detail and provide reference for descriptions.

### Event
Multi-Case Study
Three School Gardens in Southwest Montana
Hyalite Elementary School, Bozeman, MT
Sleeping Giant Middle School, Livingston, MT
Ennis Schools K-8, Ennis, MT

# APPENDIX B

## SUMMARY MATRIX OF GARDEN-BASED LEARNING RESEARCH

Appendix B: Summary Matrix of Garden-based Learning Research

| Author(s) | Title of Study | Research Questions | Methodology | Findings |
|---|---|---|---|---|
| 1.) Alexander J.<br><br>North, M.W.<br><br>Hendren, D.K. | Master gardener classroom garden project: An evaluation of the benefits to children | What are the effects on school children participating in classroom gardens? | Qualitative; triangulation across data sources; interviews; observations; qualitative data analysis | Six themes; moral development; academic learning; parent/child/community interaction; pleasant experience; influence of Master Gardener; perceived problems; the garden has had many positive effects on the children |
| 2.) The Alliance for a Healthier Generation | Case study: Engaging high school students in school garden activities. | How do we get teenagers excited about the garden? | Case study; action research, narrative description | Dedicated teachers, health enhancement; teaching lifelong skills; developing health habits; community service |
| 3.) Blair, D. | The child in the garden: An evaluative review of the benefits of school gardening. | Whether a school garden, without educators' either changing the school yard extensively or integrating broader environmental fieldwork into the curriculum, would provide sufficient experiential education to cause measurable changes in student achievement and behavior? | Evaluative Review of U.S. literature on school gardens; categorized relevant literature; quantitative studies, qualitative studies; analysis of summary of existing garden research | Results of review were positive; 9 out of 12 quantitative studies showed increased achievement and behavioral improvement; 9 qualitative studies reported positive learning and behavior effects; teachers need more training to effectively use gardening as a teaching tool |
| 4.) Carroll, C. | Growing an educational garden at your school: A study of the Hawai'i experience | What are the obstacles, challenges and successes in each of the school gardens under study? | Qualitative; case study; interviews; observations | Three main categories; the story of each garden, how it was designed and being utilized; similarities of successes and struggles of all case studies; resources for future development and support |
| 5.) Dobbs, K.<br><br>Relf, D.<br><br>McDaniel, A. | Survey on the needs of elementary education teachers to enhance the use of horticulture or gardening in the classroom. | What factors would increase the use of horticulture in the curriculum?<br><br>What factors stand in the way of teachers using horticulture? | Mixed methods; Survey; Random sample of teachers from across the state of Virginia; Included open ended response questions | Many of the responding teachers had access to a garden at home or school and already expressed a high level of interest in gardening; teachers wanted more support: lesson plans, activity guides, volunteers, and additional training; the amount of training varied by respondent |

| | | | | |
|---|---|---|---|---|
| 6.) Gallavan, N.P.<br><br>Bowles, F.A. | School-community gardening: Learning, living, earning, and giving | Will participation in a community garden project increase student knowledge and experiences related to gardening? | Action research; the 5 ideals of powerful learning (meaningful, integrative, value-based, and active learning) were implemented through the use of a community garden | Students were given the opportunity to look at the world around them and build meaningful connections. |
| 7.) Gaylie, V. | Roots and research in urban school gardens | This book explores the value of school gardens in urban areas. A school garden as a bridge between practice, pedagogy, and community and the cultural significance of gardens from a historical perspective. | Qualitative; case study; interviews; participation; students work; summary of student and teacher comments | School gardens help connect students to the world, and teach skills of adaptation; common themes of community, economy, food, increased exposure to nature influence pedagogy; we need to change the way we think about school gardens; school gardens serve multiple purposes civic, educational, economic and vocational purposes. |
| 8.) Hazzard, E.L.<br><br>Moreno, E.<br><br>Beall, D.L.<br><br>Zidenberg-Cherr, S. | Best practices models for implementing, sustaining, and using instructional school gardens in California. | Ascertain and report best practices to provide models for schools implementing or sustaining instructional school gardens. | Interview; 10 schools selected to participate; 2 levels of questioning; Level 1 implementation of a successful garden program, Level 2 using the garden to meet CA state content standards | Four fundamental areas were identified for best practice; people, funds, materials, and instruction. |
| 9.) Klemmer, C.D<br><br>Waliczek, T.M<br><br>Zajicek, J.M. | Growing minds: the effects of a school gardening program on the science achievement of elementary students | Can school gardens enhance the science achievement of students in grades 3-5? | Quantitative; Experimental design; Experimental group was provided garden-based learning curriculum; Control group did not use the garden; Both group participated in a post test to measure science achievement | Students who participated in hands-on gardening activities had a higher science achievement score; knowledge levels are increased through the use of hands-on, experiential activities. |
| 10.) McFadyen, J. | A rain garden for our school: Becoming environmental Stewards. | Students worked with community members to install and rain garden and educate the public of its importance | Action research or Ethnography; Service Learning Project; researched, acquired support, installed a rain garden, developed educational materials | Students were able to communicate effectively, give to the community, become stewards to the environment; looked at the world around them to build meaningful connections |

| | | | | |
|---|---|---|---|---|
| 11.) Ozer, E.J. | The effects of school gardens on students and schools: conceptualization and considerations for maximizing healthy development | A review of existing school garden literature | Review of existing literature; ecological theory; categorizes school gardens as systematic interdependent domains | Provides a summary of literature regarding the impact of school garden curriculum on student functioning; creates a conceptual framework to guide future research; implications; suggestions for future research |
| 12.) Swinburne, B | Growing a new school community in a garden | How can interactions in a school garden contribute to the development of seven elements of community? | Qualitative; field observations; teacher initiated actions; student initiated actions; transcribed and coded | Two main areas of positive interaction; interconnection to the earth, and working together for a common purpose; recommended continued instruction in the garden |
| 13.) Warner, V.D. | Finding common ground: Community garden as connector between culture, nature, and the individual | Does participation in community gardens produce greater social and environmental connections than gardening without this kind of space?<br><br>What are the current trends in community gardens? | Qualitative; multi-case study; open-ended, conversational interviews; transcripts of interviews are created and analyzed for common themes | Analysis of the interview data revealed that subjects who participated in these community gardens had a desire to be outside, work with the earth and plants, and to interact with community members. The study concluded that a community garden can strengthen social and environmental connections. |

# APPENDIX C

## POSSIBLE SCHOOL GARDEN SITES FOR FURTHER STUDY

Appendix C: Possible School Garden Sites for Further Study

| City | Population of City | Number of Students | School | Distance from MSU | Type of Garden | Year Established |
|---|---|---|---|---|---|---|
| Helena | 28,284 | | East Helena Public Schools Community Garden | 99 miles | Edible | 2010 |
| Missoula | 66,873 | 257 | Lowell Elementary | 205 miles | - | 2009 |
| | | 95 | DeSmet School | 210 miles | Edible | 2008 |
| | | 408 | Meadow Hill Middle School | 208 miles | Edible | 2003 |
| Livingston | 7,023 | 328 | Sleeping Giant Middle School | 29 miles | Edible | 2012 |
| Ennis | 839 | 251 | Ennis Schools (K–8) | 53 miles | Edible | 2012 |
| Bozeman | 37,326 | 298 | Irving Elemenatry | 1 miles | Edible | 2009 |
| | | 324 | Hawthorne Elemenatry | 2 miles | Edible | 2010 |
| | | 204 | Monforton School (K–8) | 7 miles | Edible | 2010 |
| | | 563 | Hyalite Elementary | 3 miles | Edible | 2009 |

# APPENDIX D

## CONSENT FORM

Appendix D: Participant Consent Form

Dear Participant,
Thank you for your interest in participation in this dissertation study. While one of the goals for this project is to fulfill the requirements for my dissertation in the Department of Education and Graduate College at Montana State University, I'm also hopeful that the information collected will be helpful to the future development of school gardens in the state of Montana and communities across the country.

Project Overview:
This study will examine the purpose and effects of a vegetable garden on school grounds. The study focus will be a multi case study. Through a series of interviews, I hope to gain valuable insight to the life of the garden from the early planning stages through its use and maintenance over time.

Procedures:
The study will take place during the 2012 academic year, with the final interviews to be concluded by April of 2013. As a participant you can expect to spend between 30 minutes to several hours between the months of August and April. You may choose to participate in any or all components of the study as your schedule allows. Participation in the study is voluntary and you may choose to end your participation at any time. The components of the study include (please initial those you would like to participate in):

_____ Interviews: As a participant you will take part in 1-3 interviews. Each interview will last between 30 minutes and 2 hours each. The length of the interview will depend on how much information you would like to share at the time. Interviews will be informal or semi-structured and conducted in an environment of your choosing (home, coffee shop, office, etc.). Any stories, ideas or information you feel is important may be discussed during the interviews. The topic of focus for the interviews will be the vegetable garden at your school. Any information related to the planning, use, and maintenance of the garden may be discussed.

_____ Tape Recording: In order to be more engaged in the conversation and accurately document
your thoughts, a tape recorder may be used in place of note taking during interviews.

_____ Photos: During any tours or site visits I will be taking photographs of the garden to enhance
my interpretation and analysis of the interview responses.

Confidentiality:
The information gathered about the school garden and your role will not be kept confidential. The school and participants in this study will be identified. Identification of the site and participants
will be given by either title or name. The information will be shared publicly as this dissertation will be published upon its completion. If at any time it is deemed necessary to protect the identity of the site or participants all names will be changed to eliminate and identifying factors.

Risks and benefits:
There are no risks to the participants of this study. The purpose of the data collected is to create a detailed picture of the school garden at each individual site. Describing the purpose of the garden the people involved and any difficulties in implementing and maintaining a garden program will help provide valuable information to further my research and potentially help other practitioners who may be considering gardening as an option for their school.

Questions about the research:
If you have any questions about the study please contact Kim Yates (406) 577-1237 or kimberly.yates@msu.montana.edu. If you have any questions about your rights as a participant please contact the Montana State University Institutional Review Board at (406) 994-6783.

Consent to Participate:
If you wish to participate in this study please sign below.

I understand that my participation in this project is voluntary and I can discontinue participation at any time.

_____
Printed name of participant

_____ _____
Participant signature Date

# APPENDIX E

## SCHOOL GARDENS: SAMPLE INTERVIEW QUESTIONS

Appendix E: School Gardens: Sample Interview Questions

**Piloted Interview Questions from 2012 Pilot Study:**

1. How would you define a garden?
2. Tell me about your personal experience and background with gardens.
3. Describe the reasons for developing a school garden.
4. How did you get involved with the school garden at Irving?
5. Tell me about the success of this garden project so far.
6. How would you describe a successful garden/what characteristics?
7. What were some challenges or unexpected events associated with starting and maintaining the garden?
8. Do you feel that the garden has impacted lives? In what ways?
9. If you could give advice to someone starting a school garden, what would you say?

**Original Focus Questions:**

1. What are the reasons for developing the garden at Irving school?
2. What makes a garden successful?
3. How does the school garden impact lives?
4. What were the challenges associated with having a school garden?

**Original Purpose of Study**:

The purpose of this case study is to explore the reasons for developing the school garden at Irving Elementary and what types of outcomes have been experienced.

**Revised Focus Questions and Interview Questions for this Study:**

1. What is your personal background or experience with agriculture or gardening?

2. What are the reasons for developing the school garden at your school?
    - Is the garden being used to promote science curriculum or other?
    - Are students learning about environmental issues?

- Do you teach students about sustainability?
- Do the students eat the vegetables, donate them, or prepare meals?

3. What makes a garden successful?
    - Do you have a garden budget?
    - Is it necessary to do fundraising?
    - Do the teachers like to use the garden?
    - Are there a lot of parent volunteers?

4. How does the school garden impact affective development?
    - Do students or teachers feel an emotional attachment to the garden?
    - Has the use of the garden changed attitudes about nature?
    - Are students impacted emotionally in any way?

5. What were the challenges associated with having a school garden?
    - How long did it take to plan?
    - Was location and design an issue or concern?
    - Is there outside support from the community?

# APPENDIX F

## INTERVIEW AND SITE VISIT SCHEDULES

Appendix F: Interview and Site Visit Schedules

| Hyalite Elementary School | | | |
|---|---|---|---|
| Name | Date | Duration | Setting/Location |
| Mike Van Vuren | 12/07/2012 | 18 minutes | Office |
| Christine O'Shea | 9/16/2012 | 16 minutes | Classroom/no students present |
| Erin Jackson | 9/12/2012 | ~45 minutes | Observation with students/interview |

| Sleeping Giant Middle School | | | |
|---|---|---|---|
| Name | Date | Duration | Setting/Location |
| Lisa Rosberg | 12/07/2012 | 14 minutes | Phone Interview |
| Dave Pettit | 9/20/2012 | ~15 minutes | Classroom/no students present |
| Genna Williams | 9/5/2012<br>9/20/2012<br><br>1/04/2013 | ~60 minutes<br>~60 minutes<br><br>~30 minutes | Garden/Greenhouse<br>Observation with students/office<br>Coffee shop |
| Mark Rehder | 12/11/2012 | ~40 minutes | Phone Interview |

| Ennis Schools K-8 | | | |
|---|---|---|---|
| Name | Date | Duration | Setting/Location |
| Brian Hilton | 12/11/2012 | ~35 minutes | Phone Interview |
| Lacy Hubner | 12/11/2012 | 9 minutes | Phone Interview |
| Natasha Hegmann | 9/08/2012<br>9/14/2012 | ~60 minutes<br>~45 minutes | Garden/no students<br>Garden/some students around |
| Janet Dochnahl | 12/11/2012 | 24 minutes | Phone Interview |
| | | | |

| Hyalite Elementary School | | | |
|---|---|---|---|
| Date | People Present | Season | Garden Growing |
| 3/13/2012 | No | Early spring | No |
| 3/24/2012 | No | Early spring | No |
| 9/03/2012 | Yes/playing basketball | Fall | Yes |
| 9/12/2012 | Yes/students | Fall | Yes |

| Sleeping Giant Middle School | | | |
|---|---|---|---|
| Date | People Present | Season | Garden Growing |
| 9/05/2012 | Yes/students | Fall | Yes |
| 9/20/2012 | Yes/students | Fall | Yes |

| Ennis Schools K-8 | | | |
|---|---|---|---|
| Date | People Present | Season | Garden Growing |
| 9/05/2012 | Yes/FoodCorps service member | Fall | Yes |
| 9/14/2012 | Yes/students | Fall | Yes |
| 9/19/2012 | Yes/Garden Dedication | Fall | Yes |

# APPENDIX G

## SAMPLES OF MATERIALS USED AS DATA

# Appendix G: Samples of Materials Used as Data

## ERIN JACKSON

**Bozeman, Montana**




From a young age, Erin was exposed to the importance of green living. The hands-on experience of building a home and planting an organic garden with her family instilled a passion for healthy communities and diets. At the University of Vermont she studied Biological Sciences and Nutrition and went on to work with Friends of Burlington Gardens where she had the opportunity to participate in every step of the farm to school process. Erin also had a chance to work on global community health while developing mobile medical health clinics in rural Ecuador and on local public health while conducting her honors thesis on thyroid cancer incidence in Vermont. She loves cherry tomatoes, especially when accompanied by hard work and food education. Erin hopes to combine the three pillars of FoodCorps service with physical activity for an all around healthy community of youth.

**Livingston**

**Livingston School District**

**Farm to School Project** (Website)

*Current VISTA: Genna Williams*

Mission:To establish rigorous project based learning and childhood nutrition through local, sustainable food systems at Livingston School District.

Goals: Increase the amount of local and fresh foods used in each school's cafeteria. Establish nutrition and health curriculum that utilizes project-based learning components. Open and establish lines of communication between school members, parents, community members, and local farmers. These connections will in turn create a network in which food security issues can be discussed and addressed.



facebook

## Natural Play Area Brainstorming

Updated about 3 months ago

Students at Hyalite shared their ideas for additional features to their natural play area last week. This is the second phase of the project started in spring 2012. They worked in small groups with Bobbi Geise from Learning By Nature to build models of their suggestions. All classrooms completed surveys about the features and uses they would like for the area as well. To date, the PAC has funded the project. Additional funding will be sought to construct these new features.

The school garden and other farm to school projects that I've been working on will continue to grow and change after I leave. The school garden is literally rooted in the schoolyard. It would take at least as much work to go backwards (imagine ripping out 4"x4" fence posts, 10 raised beds, a pergola and garden gates) as it will to go forwards. Through committee work and volunteer recruitment, the school garden has been endowed with a small army of dedicated curators. The classroom teachers we've worked with now plan projects and lessons around what's happening in the garden. Volunteers are eager to help with duties of summer weeding and watering, if only for a chance to harvest spoils from the garden. And students positively shriek when they see that purple FoodCorps t-shirt headed down the hallways: a sure sign that they'll be headed out to the garden for class.

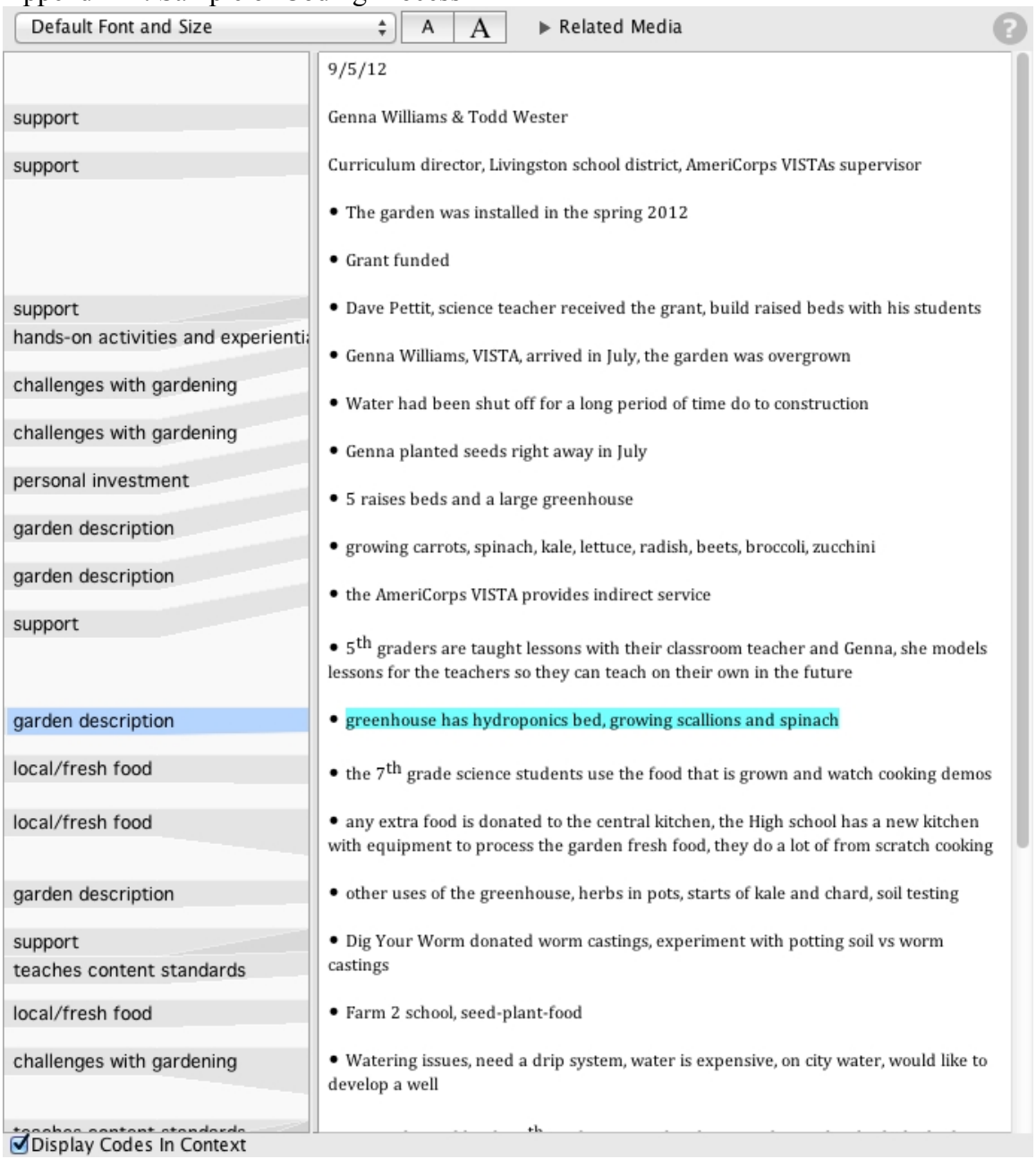



Ennis School Garden

# APPENDIX H

## SAMPLE OF CODING PROCESS

Appendix H: Sample of Coding Process



# APPENDIX I

## SCHOOL GARDEN CHECKLIST

Appendix I: School Garden Checklist

**SCHOOL GARDEN SITE VISIT CHECKLIST (unweighted)**

**GENERAL CHARACTERISTICS**

**1. Average height of plants:**
- ❑ Short (6" or less)
- ❑ Medium (7"-13")
- ❑ Tall (more than 13")

**2. Type of garden:**
- ❑ Ornamental
- ❑ Edible
- ❑ Native

**3. Garden Structure:**
- ❑ Raised Beds
- ❑ In ground

**4. Materials used in garden and accessories:**
- ❑ Borders
- ❑ Paths
- ❑ Benches
- ❑ Other

**5. Percentage of garden in sun:**
- ❑ 0-20% in sun
- ❑ 21-40% in sun
- ❑ About 50% in sun
- ❑ 60-79% in sun
- ❑ 80-100% in sun

**6. Is the school garden fenced in?**
- ❑ Yes
- ❑ No

**7. Schoolyard surface:**
- ❑ Pavement/concrete
- ❑ Grass
- ❑ Mulch
- ❑ Astroturf
- ❑ Synthetic tiling

**8. People present at time of visit:**
- ❑ None
- ❑ People viewing the garden
- ❑ People occupying garden space

**9. Type of mulch:**
- ❑ None
- ❑ Woodchips
- ❑ Hay/straw
- ❑ Grass clippings

**10. Path material:**
- ❑ None
- ❑ Woodchips
- ❑ Crushed stone
- ❑ Gravel
- ❑ Stepping stones
- ❑ Bricks
- ❑ Grass
- ❑ Dirt
- ❑ Other

**11. Garden borders:**
- ❑ None
- ❑ Wooden
- ❑ Plastic
- ❑ Metal
- ❑ Rocks
- ❑ Mulch
- ❑ Raised Beds
- ❑ Other

**ECOLOGICAL VALUE**

**12. Permeability of area where water drains:**
- ❑ Permeable
- ❑ Impermeable

**13. Pollinators present:**
- ❑ None
- ❑ Bees/wasps
- ❑ Butterflies
- ❑ Dragonflies
- ❑ Hummingbirds
- ❑ Other

**14. Wildlife present:**
- ❑ None
- ❑ Birds
- ❑ Toads
- ❑ Squirrels
- ❑ Other

2012 © E2 Evaluation

**SCHOOL GARDEN SITE VISIT CHECKLIST (weighted)**

*Brackets indicate maximum number of points possible*

**VISIBILITY (5%)**

**1. Number of windows facing the garden:** [1]

- ❑ None [0]
- ❑ Some [0.5]
- ❑ Many [1]

**2. Proximity to school entrance:** [1]

- ❑ Far [opposite side of school grounds from an entrance] [0]
- ❑ Somewhat close [close to school building] [0.5]
- ❑ Close [adjacent to building near door] [1]

**3. Visibility of garden:** [0.5]

- ❑ Not visible from main entrance [0]
- ❑ Visible from main entrance [0.5]

**INNOVATION (5%)**

**4. Presence of art:** [1.5]

- ❑ None [0]
- ❑ By professional artists [1]
- ❑ By student artists [1]
- ❑ By both student and professional artists [1]
- ❑ Comments: [up to 0.5]

_____

_____

**5. Observations of innovative features:** [1]

_____

_____

**EXTERNAL RESOURCES (10%)**

**6. Evidence of external resources and/or partnerships:** [2.5]

- ❑ Joint art projects [0.5]
- ❑ Plaques [0.5]
- ❑ Sponsor Sign [0.5]
- ❑ Acknowledgment sign [0.5]
- ❑ Other [0.5]

**MAINTENANCE (50%)**

**7. Effectiveness of borders:** [2]

- ❑ Ineffective [0]
- ❑ Delineated [1]
- ❑ Preventing erosion [1]

**8. Prevalence of weeds:** [1.5]

- ❑ None [1]
- ❑ Low prevalence in beds (10 per square meter) [0.75]
- ❑ Medium prevalence in beds (11-25 per square meter) [0.5]
- ❑ High prevalence in beds (more than 25 per square meter) [0.5]
- ❑ Low prevalence in isolated areas [0.25]
- ❑ No weeds on paths [0.25]

2012 © E2 Evaluation

**SCHOOL GARDEN SITE VISIT CHECKLIST (weighted)**

*Brackets indicate maximum number of points possible*

**MAINTENANCE CONT. (50%)**

**9. Limited signs of erosion:** [3]
- ❑ No exposed roots [1]
- ❑ No dirt or mulch outside of garden boundaries [1]
- ❑ No uneven terrain due to water flow [0.5]
- ❑ Other [0.5]

**10. Signs of watering:** [1]
- ❑ Hose or sprinkler [1]
- ❑ Drip irrigation [1]
- ❑ Other [1]

**11. Broken/missing items:** [2]
- ❑ Nothing broken [1]
- ❑ Nothing missing [1]

**12. Litter:** [1]
- ❑ None [1]
- ❑ Some (1-5 pieces) [0.5]
- ❑ A lot (6 or more pieces) [0]

**13. Graffiti:** [1]
- ❑ None [1]
- ❑ Some [0]

**EASE OF USE (30%)**

**14. Themed beds:** [0.5]
- ❑ Not present [0]
- ❑ Present [0.5]

**15. Plant labels:** [1.25]
- ❑ None [0]
- ❑ Some plants, not all [0.5]
- ❑ Most plants [0.5]
- ❑ Some plants, not all [0.75]
- ❑ All plants [1]
- ❑ No water damage or fading [.25]

**16. Seating space:** [1.75]
- ❑ None [0]
- ❑ Space for small groups/individuals [0.75]
- ❑ Space for classroom [1]

**17. Presence of signage:** [1]
- ❑ None [0]
- ❑ Educational [1]
- ❑ Prompts [0.5]

**18. Quality of signage:** [1]
- ❑ Low [0]
- ❑ High [1]
- ❑ Prompts [0.5]

2012 © E2 Evaluation