May 2017

High School Gardens Program across the Nation: Current Practices, Perceived Benefits, Barriers, and Resources

Noehealani Cierra Bareng- Antolin
University of Nevada, Las Vegas, noehealaniantolin@gmail.com

HIGH SCHOOL GARDENS PROGRAM ACROSS THE NATION: CURRENT PRACTICES, PERCEIVED BENEFITS, BARRIERS, AND RESOURCES

By

Noehealani Bareng-Antolin

Bachelors of Science- Biological Sciences
University of Nevada, Las Vegas
2011

A thesis submitted in partial fulfillment
of the requirements for the

Master of Public Health

Department of Environmental and Occupational Health
School of Community Health Sciences
Division of Health Sciences
The Graduate College

University of Nevada, Las Vegas
May 2017

UNLV | GRADUATE COLLEGE

Thesis Approval

The Graduate College
The University of Nevada, Las Vegas

May 1, 2017

This thesis prepared by

Noehealani Bareng-Antolin

entitled

High School Gardens Program across the Nation: Current Practices, Perceived Benefits, Barriers, and Resources

is approved in partial fulfillment of the requirements for the degree of

Master of Public Health
Department of Environmental and Occupational Health

Jennifer Pharr, Ph.D.
Examination Committee Chair

Kathryn Hausbeck Korgan, Ph.D.
Graduate College Interim Dean

Courtney Coughenour, Ph.D.
Examination Committee Member

Timothy Bungum, Dr.Ph.
Examination Committee Member

Bracher Poston, Ph.D.
Graduate College Faculty Representative

Abstract

School garden programs in the United States emerged near the end of the 19th century. The use and purpose of school gardens are multifaceted and is dependent on the school and individuals involved. Current research on school garden programs suggests positive benefits for student academic achievement, nutrition knowledge, and dietary behaviors. Research on school garden programs is predominately conducted at the elementary and middle school levels. High school garden programs do exist; however, there is limited research on the current practices, perceived benefits of, barriers to, and resources necessary for high school garden programs. The purpose of this study was to collect information on high school garden programs nationwide and identify the current practices, perceived benefits, barriers, and resources needed to implementing and sustaining a high school garden program. The survey was sent to Farm to School state lead contacts in all 50 states and then distributed to their garden network. Forty-two respondents completed the survey and were included in the final data analysis. Many respondents reported seeing positive benefits to having a school garden program at the high school level. Current practices, barriers and perceived benefits associated with having a high school garden, and implementation and sustainability strategies are presented in this study. Results from this study may assist new or existing high school garden programs.

Acknowledgements

I would like to express my most sincere gratitude to my siblings: Kekoa, Keola, and Kawika for their constant support and encouragement. A simple thank you to my parents: Conrad and Nancy Antolin, words cannot express the immense love and appreciate I have for you both. I deeply thank the both of you from the bottom of my heart for always being there for me.

To my committee members: Dr. Timothy Bungum, Dr. Courtney Coughenour, and Dr. Brach Poston, thank you for your guidance. I appreciate the time you all took in guiding me towards completing my thesis. A special thank you goes out to my committee chair, Dr. Jennifer Pharr. You are truly an amazing individual. I appreciate your positivity and constant support in helping me finish my thesis.

Without the support from Dr. Shawn Gerstenberger, I would not have had the opportunity to work for the School of Community Health Sciences. You have given me many opportunities to develop professionally, and taught me many things. You have done so much for me; I cannot express how much that means to me.

I would also like to personally thank Dr. Carolee Dodge-Francis, for always being there for me. You are much more than just a professor, you are like family. You are a wonderful mentor, and I thank you for pushing me to my highest potential.

I would not be pursuing a Masters of Public Health degree if it was not for Dr. Michelle Chino. Thank you for believing in me when I did not. Thank you for giving me the courage to apply to the program.

To my friends: I thank each and every one of you for always encouraging me to finish my degree, and being there for me when times got tough. Thank you all for the love and encouragement.

Lastly, I would like to thank Michael Villa Jr. for his love and support. You have showed me that I sometimes need to think outside of the textbook. Thank you for being a shoulder to cry on when the pressures of graduate school got the best of me.

Dedication

This is dedicated to my: family, friends, and future family

Table of Contents

List of Tables

List of Figures

Chapter 1- Introduction

The existence of school gardens emerged near the end of 1890's. By 1919, the federal government funded a national program called the United States School Garden Army, which involved the participation of thousands of children for producing food for the war effort. Proponents of school gardens have utilized them as a teaching mechanism for patriotism, ethics, and nature (Trelstad, 1997). Historically, school gardens were intended for instructional lessons about nature, various life cycles and natural phenomena (Kohlstedt, 2008). Over the past two decades, school garden programs have become a growing movement across the nation.

In 1995, The California Department of Education launched their initiative, "A Garden in Every School," (ultimately enacted in 2006) which provides resources to develop and sustain school garden programs in the state of California (Graham, Beall, Lussier, McLaughlin, & Zidenberg-Cherr, 2005). School garden programs vary in purpose, and how they are operated and utilized. School gardens vary in design, with some having raised beds and others having sunken beds. The design of a garden can also be for focused learning in subject areas like science, math, nutrition, or on the natural environment (Bucklin-Sporer & Pringle, 2010).

Each garden is distinctive to its own program based on factors such as but not limited to, space availability, funding, and the people involved in the maintenance of the garden. Today's youth lack real life experience with the ecosystem (Blair, 2009). In Blair's evaluative review (as cited by U.S Department of Agriculture, 2006), 83% of the nation's population lives in metropolitan surrounding, thus limiting true experience of nature. School gardens provide students with the opportunity to have hands-on learning, even in a school with limited resources (Bucklin-Sporer & Pringle, 2010).

Children spend most of their time in a school setting (6.64 hours), which makes schools the main target for programs that encourage fruit and vegetable consumption (Hazzard, Moreno, Beall & Zidenberg-Cherr, 2011; U.S. Department of Education, 2008). The rise in obesity has been attributed to, among other things, nutritional changes and food options made available to students throughout their school day (Mary Story, Marilyn S. Nanney, & Marlene B. Schwartz, 2009). Moreover, students consume much of their daily calories at school, thus making the school environment an ideal place to encourage healthy eating behaviors (Mary Story, Marilyn S. Nanney, & Marlene B. Schwartz, 2009). School gardens that grow edible produce provide students with a unique experience by learning first-hand about food and nutrition while they work in the garden. Some garden programs provide workshops for students to learn how to harvest produce and create healthy meals. Additionally, programs may teach students how to engineer water-saving tools for their garden, the importance of composting, while learning about the relevance of science and nature.

School garden programs can provide students with the opportunity to learn about the environment and where food comes from, promote healthy eating, and establish a foundation for youth development (Mary Story, Marilyn S. Nanney, & Marlene B. Schwartz, 2009). Identifying the purpose of having a school garden can help shape what is expected from support staff, school administrators, teachers, and community.

Schools are faced with many challenges during the implementation phase of a school garden, which is in part due to funding, time, and staff involvement (Ozer, 2006). Lack of time, funding, and support from school officials directly impacts the effectiveness of a school garden program. Failure of school garden programs may also be influenced by a shift of personnel at the school. Collectively, garden sustainability and success is dependent on principal, teachers,

parents, and students support (Ozer, 2006). A mailed questionnaire was disseminated to 1,665 California fourth grader teachers at schools with garden programs. The teachers were asked questions regarding the current practices, attitudes, and barriers associated with having a school garden. In total, 592 questionnaires were completed and returned. Teachers indicated several barriers to using the garden for academic lessons were, time (67%), lack of teachers' interest in gardening (63%), and lack of experience working in the garden (61%) (Graham, Beall, Lussier, McLaughlin & Zidenberg-Cherr, 2005).

There are many benefits of school gardening for students. Studies show that school gardens have the potential to increase fruit and vegetable consumption, physical activity, and literacy in many subjects such as science and math. School gardens that integrate nutrition-education have been shown to increase fruit and vegetable consumption among youth, as they plant and harvest their own produce, they are more than likely to try them (Robinson-O'Brien, Story, & Heim, 2009) Additionally, Parmer, Salisbury-Glennon, Shannon, and Struempler (2009) discovered that students who received nutrition education and gardening were more likely to choose vegetables during school lunch than students who only had a nutrition education class. A study on the effects of school gardens on elementary school student's physical activity in New York revealed that school gardens have the potential to reduce sedentary activities when compared to schools without gardens (Wells, Myers, & Henderson, 2014). Moreover, Williams and Dixon (2013) analyzed research studies between 1990-2010 that examined the impact of garden-based learning on academic achievement in schools, and they found that garden-based learning had a positive impact on several core subjects such as science, math, language arts, and social studies.

Rationale for Study

The Centers for Disease Control (CDC) assessed fruit and vegetable consumption among high school students by analyzing the 2010 National Youth Physical and Nutrition Study (NYPANS) (2011). Results from this analysis showed that in 2010, 28.5% of high school students consumed less than one fruit a day, and 33.2% consumed less than one vegetable a day (CDC, 2011). However, the CDC recommends that adolescent females consume 1.5 cups of fruit and 2.5 cups of vegetables, and that adolescent males consume 2 cups of fruit and 3 cups of vegetables a day (CDC, 2011).

Despite the overwhelming amount of research on school gardens at the elementary and middle school levels, there is limited amount of research on school garden programs at the high school level. According to Williams and Dixon (2013), the grades least studied with regards to school gardens were preschool and grades 10-12.

Current research on school gardens show positive impacts on student literacy in science and other core subjects, healthy eating habits, overall well-being, and physical activity; however, there is a gap in the literature looking at the current practices, barriers and benefits, and funding sources for school gardens at the high school level. Thus, it is important to ascertain information about high school gardens across the United States to help others implement and sustain garden programs at their high schools.

Purpose

The purpose of this study is to identify the current practices, barriers, perceived benefits, and funding resources for high school garden programs across the nation. This information can

be used to help schools develop their own gardens and overcome obstacles that typically face school garden programs.

Objectives

This study will gather information about high school garden programs nationwide. This study will examine the types of gardens being used, funding sources, practices, and perceived benefits and barriers to high school garden programs. The objectives for the study are:

1. To determine how high school garden programs are being utilized
2. To determine the current practices, perceived benefits, and barriers to having a high school garden.
3. To determine funding sources used.

Chapter 2 - Literature Review

History of School Gardens

School gardens began to be widely used during the 1890's and early 20th century. During World War I, the federal government established national programs that focused on gardening and agriculture to encourage Americans to be patriotic and loyal to their nation by taking part in food production and conservation efforts (Hayden-Smith, 2007). A notable national program called the United States School Garden Army (USSGA), allowed American youth to be involved in the war efforts (Hayden-Smith, 2007). The USSGA produced thousands of gardens nationwide as part of the war efforts for World War I (Kohlstedt, 2008). Young children were able to engage in the war efforts on the home front by producing food for the soldiers, communities, and families (Kohlstedt, 2008). President Woodrow Wilson supported the USSGA on the principle that every child wanted to feel like they were a part of the fight in France (Kohlstedt, 2008). By the end of WWI, the USSGA estimated that over a million American youth were "enlisted" in the School Garden Army; however, after the war ended the garden movement dissipated (Hayden-Smith, 2007).

School gardens in the United States regained popularity between 1960-1975 as a result of the educational reform plan for the "war on poverty," and the environmental movement which led to the concept of school gardens as a hands-on learning opportunity for children to understand and connect with the natural environment (Subramaniam, 2002). There was an eventual decline in the school garden movement during 1980's and early 1990's as the shift in educational and environmental programs and policies changed to more of a conservative framework. Despite the decline of school garden programs, in 1981 the United States Department of Agriculture developed the Agriculture in the Classroom Program (AITC) to

improve agricultural literacy among PreK-12 teachers and students (National Agriculture in the Classroom, 2016). The AITC program provides resources such as guidance and grants to help states develop and conduct programs and initiatives to meet the AITC goals and objectives of integrating agriculture in the classroom. The AITC program is in every state and territory, and is state specific in regards to the needs and interests of the state.

In 1994, the California Department of Education developed the California School Garden Initiative with the intent to have "a garden in every school" in California and to encourage schools to establish and sustain school gardens as outdoor learning classrooms. In 1995, the initiative was formally called the California Instructional School Garden Program. The Governor's and Legislatures decision to support and promote instructional gardens was based on the overwhelming amount of research showing the potential impact school gardens may have on students' academic achievement and overall well-being (Hazzard, Moreno, Beall, & Zidenberg-Cherr, 2011). Between 1994 and 2006 gardens were built. The movement evolved through time from an initiative to a funded movement: 1993- Bay Area garden Conference, 1994- the garden in every school initiative, 2005- California School Garden Network, 2006- the bill was signed, and 2007 funds were rolled out for the California School Garden Network..

First Lady Michelle Obama brought more attention to the gardening movement in 2009 when she and Secretary of Agriculture, Tom Vilsack and students from a Washington D.C. elementary school planted a garden on the White House lawn. This is the first garden at the White House since Eleanor Roosevelt's Victory Garden during WWII (Djang Jason, 2009). The White House Garden provides fresh produce for the First Family Dinners, State Dinners, and other White House events. 'The Let's Move!' initiative by First Lady Michelle Obama was dedicated to solving childhood obesity in the United States by providing families with access to

healthy foods, providing healthier food options in schools, and encouraging children to become more physically active (About Let's Move, 2016).

In 2011, Agriculture Secretary Tom Vilsack announced the development of the People's Garden School Pilot Program to promote garden-based learning in elementary schools in Washington, New York, Iowa, and Arkansas. Mr. Vilsack stated, "School gardens hold great promise for educating our kids about food production and nutrition. Learning where food comes from and what fresh food tastes like, and the pride of growing and serving your own fruits and vegetables, are life-changing experiences" (U.S Department of Agriculture, para. 2).

School gardens are multifaceted, and have been around for many decades for various reasons. One reason for the recent rise in school gardens in the United States is the alarming obesity rates in young children. According to Ogden, Caroll, Fryar, and Flegal (2015), nearly 17% of children in the United States aged 2-19 years are obese. As one effort to combat the rising childhood obesity rates, school gardens are being utilized as a nutrition educational tool to teach young children about the importance of healthy eating.

Perceived Attitudes/Barriers and Use of School Gardens

According to a research study, California elementary school teachers with gardens at their schools perceived school gardens may have some positive impact on academic performance, physical activity, language arts, and healthy eating choices (Graham & Zidenberg-Cherr, 2005). Most teachers rated their school gardens as moderately to very effective for improving science and social skills (Graham & Zidenberg-Cherr, 2005). Additionally, teachers strongly agreed that there is a need for more resources for teacher training in gardening, and how to connect curriculum to academic instruction (Graham & Zidenberg-Cherr, 2005).

According to Graham and Zidenberg- Cherr (2005) nearly 70% of the teachers in the study expressed the most challenging aspect in having a garden for academic instruction was time. More than half of the teachers expressed that teachers' lack of interest, experience, and knowledge in gardening, and a lack of curricular materials linked to academic requirements were also barriers to using school gardens for academic learning (Graham & Zidenberg-Cherr, 2005).

Similarly, a research study ascertained the best practices for implementing, sustaining, and utilizing a school garden in California through a series of interviews with key members (a person that had direct involvement with the success of the school garden) in ten schools with model instructional school gardens. The results revealed the best practices for creating, sustaining, and utilizing a school garden required people, funding sources, materials, and instruction (Hazzard, Moreno, Beall & Zidenberg-Cherr, 2011). Key members identified several groups and people who were committed to the success of their school garden including principals, teachers, students, parent and community volunteers, garden coordinators, and parent-teacher associations/organizations (Hazzard, Moreno, Beall & Zindenberg-Cherr, 2011). The study showed that having a Garden Coordinator, (a person who spends the most time in the garden sustaining and utilizing it), and Master Gardeners from the Master Gardener Program (a person who received an extensive amount of training on horticulture topics, and provides free technical assistance during the implementation stage of the garden program), were essential to the success of these school garden programs (Hazzard, Moreno, Beall & Zindenberg-Cherr, 2011). Additionally, the study found that funding and materials for school garden programs were mostly provided through grants; however, schools that did not receive grant funding received funding from local foundations and/or sponsors (e.g., booster clubs, parent-teacher associations, fund raisers) (Hazzard, Moreno, Beall & Zindenberg-Cherr, 2011). Lastly, this study revealed

additional barriers to having a school garden such as a lack of funding, administration support, or full time support from garden coordinators or volunteers, and worn out teachers.

The University of Nevada Cooperative Extension's social horticulture program is focused on creating school garden programs to improve educational objectives for children in Las Vegas (O'Callaghan, 2005). Focus group interviews conducted by O'Callaghan (2005) revealed that community stakeholders in Las Vegas viewed school garden programs as a top priority, and that there was a need for youth in the field of horticulture. Moreover, surveys administered to principals showed that most elementary school principals wanted a school garden with supplemental teacher training (O'Callaghan, 2005). Participants in the study indicated the barriers associated to school gardens were cost and vandalism. They also reported that the most challenging aspect of having a school garden was the maintenance of the garden. Participant's reason for school garden failures was the transiency of teachers who were in charge of the garden (O'Callaghan, 2005). In order to create a school garden culture in Las Vegas, it is important for teachers to be educated in gardening and instruction (O'Callaghan, 2005).

A research study conducted by Murakami, Pharr, and Bungum (2016) evaluated administrators' and teachers' perceptions on the benefits and barriers to school garden programs in the Clark County School District in Nevada. The results from this study revealed that more than half of the educators in this study indicated that lack of time was the most common barrier associated with having a school garden, and that only 4-5% of teachers indicated that a barrier to having a school garden was the lack of administrative support (Murakami, Pharr, & Bungum, 2016). The perceived benefits of school gardens commonly identified by teachers were increased nutrition literacy, fun for teachers and students, and an impactful learning tool (Murakami, Pharr, & Bungum, 2016). Also, more than 50% of educators in the study indicated that the school

garden improved environmental awareness, attitude towards school, and improved nutrition and health habits (Murakami, Pharr, & Bungum, 2016).

Academic Performance and Student Engagement

Few studies have evaluated the effectiveness of garden-based education on student achievement, and have been mixed findings as to whether academic performance improved. Skinner and Chi (2011) conducted a research study to determine key quantitative indicators of student engagement in garden-based learning and to evaluate whether garden-based programs predicted science and school achievement. A survey was disseminated to 310 middle school students in the 6th and 7th grade from the Pacific Northwest (Skinner & Chi, 2011). Results from this study showed that student participation in the garden was connected to their self-reported engagement in science class, to their academic self-perception, and overall connectedness to school (Skinner and Chi, 2011).

A research study conducted by Pigg, Waliczek, and Zajicek (2006) examined the effects of a school gardening program on science and math scores of third through fifth grade elementary students in Texas. Students were selected to be in experimental or control groups based on whether their teachers were utilizing the garden curriculum. Students in the experimental group participated in the garden program which used a youth gardening curriculum in addition to classroom math and science courses; whereas the students in the control group did not participate in the school garden program, but still had classroom math and science courses (Pigg, Waliczek & Zajicek, 2006). Results for this study indicated no significant difference between the experimental and control group regarding science achievement scores which was determined through a validated test administered by the teacher. The control group had a higher score on their math achievement test, but it was noted the youth garden curriculum used in the

experimental group did not include math, which may explain the higher average score in the control group. The experimental group may have had students that on average had higher math scores to begin with. The researchers conclude that there is a need for further improvement in garden curriculum to increase math and science test scores (Pigg, Waliczek, & Zajicek, 2006).

Klemmer, Waliczek, and Zajicek (2005) assessed the effectiveness of school gardening for improving science achievement in seven elementary schools in Temple, Texas. Students assigned to the experimental group had a school gardening program that was integrated into their science curriculum. Students in the control group had no school garden program and received only classroom science instruction. Students in the experimental group had a higher science score compared to students in the control group (Klemmer, Waliczek, & Zajicek, 2005).

High school curriculum is geared toward preparing a student to enter post-secondary education, and taking college entrance exams. Studies are needed to assess whether garden-based curriculum improve student performance in core academic subjects like English, math, science, and social studies at the high school level.

Nutrition Education

A research study conducted by McAleese and Rankin (2007) examined the effects of garden-based nutrition education on fruit and vegetable consumption in sixth grade students in Idaho. Students from three elementary schools were assigned to one of two experimental groups or a control group that only received food-recall workbooks pre/post intervention. Experimental group one received 12 weeks of nutrition education and food-recall workbooks, and experimental group two received 12 weeks of nutrition education, supplemental learning in the garden, and food-recall workbooks (McAleese & Rankin, 2007). Results indicated that there was

no significant difference between the control group (no intervention) to experimental group one in fruit and vegetable consumption; however, there was an increase in fruit and vegetable consumption, and vitamin intake after the intervention for students in experimental group two (McAleese & Rankin, 2007). The researchers argued that an effective garden-based nutrition education program with a gardening component may have an impact in increasing fruit and vegetable consumption among sixth graders.

Similarly, a research project conducted by Beckman and Smith (2008), examined the changes in dietary habits and nutrition/garden knowledge among inner-city youth ages 8-15 years old from Minneapolis, Minnesota. The youth participated in a 10-week garden program called Youth Farm and Market Project received various lessons in environmental responsibility, cultural diversity, experiential learning through the garden, and nutrition education three times a week (Beckman & Smith, 2008). Analysis of the data revealed that girls did not have a significant increase in nutrition/garden knowledge or fruit and vegetable consumption after the program; however, boys had a significant increase in fruit and vegetable consumption after the program (Beckman & Smith, 2008).

Hermann and colleagues (2013) evaluated the impact of an after-school garden education program on vegetable intake and physical activity in 3rd-8th grade students in Oklahoma. The children in this study received education on various food groups, food safety, food portions, eating out, etc., and participated in gardening activities such as maintenance and care for the garden (Hermann et al., 2013). This study found that there was a significant increase in consumption of vegetables and physical activity between pre- and post- intervention scores (Hermann et al., 2013). Additionally, this study found that incorporating gardening with food preparation activities and nutrition and physical activities were effective for improving children's

vegetable intake and physical activity in after school programs. Also worth noting, school principals reported that the use of the school's salad bar doubled after the implementation of the after school gardening program (Hermann et al., 2013).

Research on gardens in High School

Few studies have evaluated the impact of school garden programs on high school students. A meta-analysis conducted by Blair (2009) discovered that there were no quantitative studies and only two qualitative studies on high school students participating in school gardens. Blair (2009) found that, although the studies did not fit the standard of in school gardening, the studies suggest ways of engaging older youth in gardening. For example, a study conducted by Lekies, Eames-Sheavly, Wong, and Ceccarini (2006) evaluated a New York State 4-H children garden consultant program where 7 girls aged 7-15 years assisted adults in designing children's school gardens. The girls in the program received informational packets containing lists of websites on children's school gardens so that they would be familiar with children's gardens. The girls then participated in a 3-day event consisting of various activities such as presentations, garden site visits, briefing sessions, and a culminating event in which the youth presented their children's garden design. As a result of this 3-day event, the girls were confident in mentoring adults about designing and managing a children's garden (Lekies, Eames-Sheavly, Wong, & Ceccarini, 2006).

Krasny and Doyle (2002) conducted a study seeking to engage inner-city youth ages 9-16 years old in participatory research with adult gardeners in their community. Results from this study revealed that engaging youth in participatory research in the gardens was challenging, yet it may have a great impact on youth development, science knowledge, and overall community engagement (Kransy & Doyle, 2002). Additionally, a project in rural Arizona involved high

school students who were tending to a community and demonstration garden near a health center with the purpose of encouraging home gardening in the local area among high school students and the community. The findings from this project showed that rural community gardens in low populated areas increased participation in gardening if they were located near a communal site (Sullivan, 1999 .

Campbell, Waliczek, Bradley, Zajicek, and Townsend (1997) conducted a research study to determine if educators can influence the environmental behaviors of high school students through hands-on activities or action-based learning curriculum. The results revealed that students who participated in the propagation experiment (cultivating wetland plants) had a higher environmental attitude score at the end of the curriculum.

An internship report surveying the status of ten high school gardens nationwide discovered that subject areas most frequently taught using the garden were: Science, Nutrition/Health, Math, and other (i.e., Spanish, Photography, Art, Government, Horticulture, and Sociology) (Antolin, 2015). The report also revealed that all ten high school gardens were being utilized for instructional lessons and most of the produce harvested from the garden was being used in school meals (Antolin, 2015). Furthermore, the report stated that the reason for one high school garden's program success was due to strong community and student involvement during the spring and summer months which contributed to their garden's sustainability. The report also highlighted that a high school garden program taught students good stewardship of the environment, and re-familiarized students with natural environment where food is produced (Antolin, 2015).

A high school in New Jersey gave students the option to receive physical education credit for gardening. Physical education teacher Matt Wilkinson said, "We're giving students another option to mainstream physical education… How long is somebody going to play basketball or soccer? Gardening they can do their whole lives" (Flesher Jared, para. 4). As a result, close to a dozen high school students from a Washington, D.C. school are harvesting vegetables and herbs from their school garden to be sold at their local farmers market. A student stated that she likes working in her school's garden because it has encouraged her to try new things like eating more vegetables. She brings home produce from the school's garden to share with her family, and has encouraged them to buy more fruits and vegetables (Pfleger, 2015). Studies show that school gardens have the potential to improve dietary habits, physical health, and improve science/nutrition/health literacy. School gardens provide many benefits to students, schools, and communities.

Due to the lack of research studies on high school garden programs, very little is known about current high school garden practices, barriers and perceived benefits associated with having a high school garden, or the current funding sources used to implement and sustain a high school garden. This study was developed to understand how high school garden programs are being utilized across the United States and determine potential benefits and barriers associated with them.

Chapter 3 - Methods

Research Questions

Main research question: How are high school garden programs being utilized across the United States?

1. What are the current practices being utilized in high school gardens?
    a. How is the school garden used?
        i. Who primarily teaches in the school garden (i.e., teacher, garden coordinator, volunteers)?
        ii. How often do students participate in the garden?
    b. What subjects are being taught in the garden?
        i. Core academic subjects
        ii. Non-core academic subjects
        iii. Materials and resources used for academic instruction
    c. What are the funding sources
    d. How are data collected
        i. Methods used to collect data
2. What are the reasons for having a school garden program?
3. What are the barriers to having a school garden program?
4. What are the perceived benefits to having a school garden program?

Research Design

A cross-sectional research design will be used to determine the current practices, perceived benefits, barriers, and funding sources of high school garden programs nationwide.

Subjects

The target population for this study was teachers, administrators, and/or garden facilitators at high schools across the United States that had school gardens. The National Farm to School Network (NFSN) works to bring local food and agriculture education into schools, and provide support at the state, regional, and national levels to help expand the number of farm to school programs across the United States (National Farm to School Network, 2016). The Farm to School movement seeks to give students and the communities they live in, access to healthy and local foods. The core elements of Farm to School are: education, procurement, and school gardens (National Farm to School Network, 2016). Farm to School is in all 50 states including Washington, D.C. The survey was sent to each state's lead contact person, and disseminated through his or her network. The goal was to ascertain information from 50 high school garden programs nationwide.

Inclusion/Exclusion Criteria

To be included in this study, the person answering the survey needed to be involved in a school garden program, at a high school in the United States. Additionally, only one survey per school was included in the data analysis. If the person indicated that their school did not have a garden, if the garden did not serve high school students, or if the survey was less than 92% completed, the responses were eliminated from the data analysis.

Content of Survey

LifeLab and the California School Garden Network developed the survey utilized in this research study. The California School Garden Survey was developed to gain an understanding of the factors that affected the implementation and sustainability of a school garden (2014 California school garden survey, 2014). The Life Lab 2013-2014 School Garden Survey was adopted and slightly modified in order to answer the specific research questions for this study. The survey consists of 47 questions, and took about 20-minutes to complete. The survey included both open and closed-ended questions. The questions in the survey ask about current garden practices, barriers and perceived benefits of having a garden, and funding sources used to implement and sustain the garden.

Data Collection and Statistical Analysis

Qualtrics is a web-based software used by the UNLV community. This research survey site is used to create and conduct online surveys, collect and store data, and generate analysis reports. For this study Qualtrics was used to create the online survey, distribute an email with an anonymous link to the survey, and assisted with the statistical analysis of the information collected. The data collected was exported from Qualtrics to SPSS to conduct descriptive statistics. Descriptive statistics included counts and percentages.

Ethical Approval

Prior to data collection, approval was obtained through the University of Nevada Las Vegas (UNLV's) Institutional Review Board (IRB).

Chapter 4 - Results

This section describes the findings from the High School Gardens Program Across the Nation Survey that was disseminated throughout the United States. The survey was adapted from California Life Lab's 2014 Garden Survey and included additional questions about implementation, sustainability, and data collection. Questions in the survey addressed: the current high school garden practices, resources associated with having a high school garden, and the perceived benefits and barriers associated with having them. Moreover, general information (i.e., location, school type, school enrollment, etc.) was collected.

Initially, the High School Gardens Programs Across the Nation Survey was disseminated by the National Farm to School Network via email to 50 Farm to School state leads. Next an additional 150 people who are co-supports to state leads in each state were sent the email with the link to the survey. The Farm to School state leads and co-supports were asked to distribute the email survey to their network of school garden participants on two occasions.

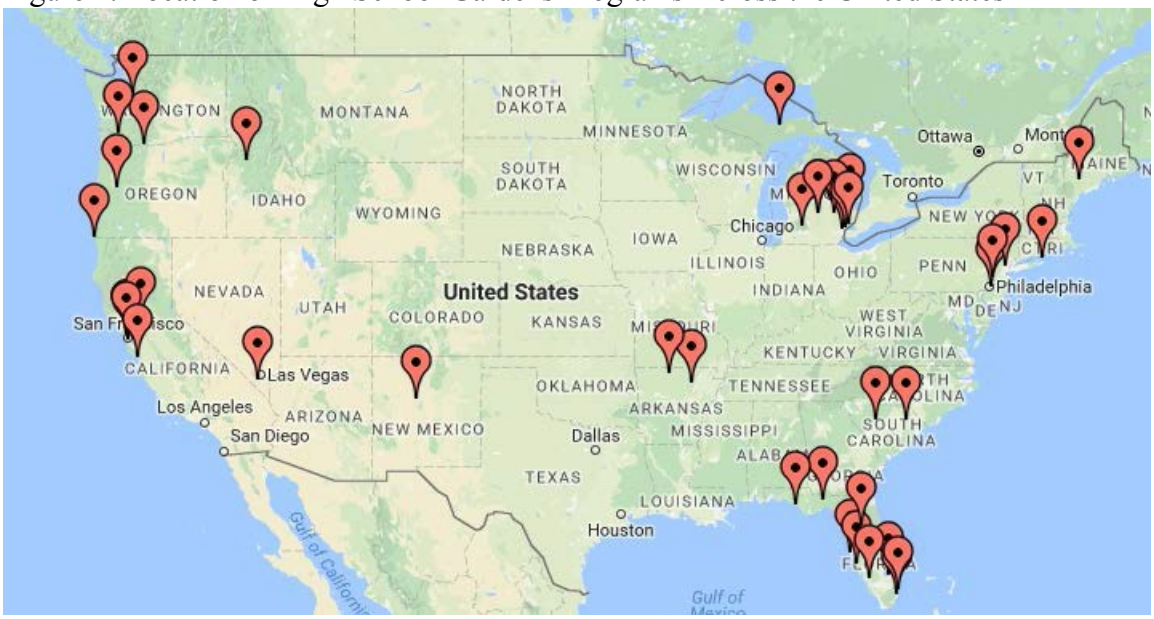
Because the survey was sent out via email from the Farm to School state leads and co-supports, it is not possible to know how many people received the email or how many people read the email. Seventy people consented to take the survey and a total of 57 respondents completed 92-100% of the survey. Of the 57 respondents, five indicated they did not have a school garden program, and five indicated they had a school garden but it did not serve high school students; they were excluded from the final analysis. Additionally, one respondent did not indicate the grade level(s) of their high school garden program, and one respondent indicated their school garden program only served Pre-Kindergarten – 8^{th} grade, thus these respondents were excluded from the final analysis. Moreover, two respondents indicated they were

responsible for more than one school; they were also excluded from the analysis. Two respondents were from the same school, but only one of their responses were recorded and used in the final analysis.

Included in the final analysis were 42 respondents that indicated that they had a school garden program and that it served high school students. The majority of respondents came from different cities within a state.

General Information/ Location of High School Garden Programs

Figure 1. Location of High School Gardens Programs Across the United States



Not seen on map: Anchorage, Alaska

As seen in Figure 1, nine high school garden programs were in Michigan (21.4%). Nine high school garden programs were in Florida (21.4%). Six high school garden programs were in California (14.3%). Four high school garden programs were in New Jersey (9.5%) and there were three in Oregon (7.1%). High School garden programs were also located in the following

states: Washington (2), South Carolina (2), New Mexico (1), Nevada (1), Massachusetts (1), Maine (1), Idaho (1), Arkansas (1), and Alaska (1).

Respondents were asked to identify the type of neighborhood in which their high school was located. Fifteen high schools were in urban neighborhoods (35.7%), fourteen were in suburban neighborhoods (33.3%), and thirteen high schools were in rural neighborhoods (31.0%). Thirty-nine high schools were public institutions (92.9%), and three schools were private institutions (7.1%).

Respondents were asked what role they served in supporting the garden. Twenty-six respondents were teachers (61.9%), six were Non-profit Support Organizations (i.e., development officer, school garden coordinator for Sprout Urban Farms, Food Crops State administrator, Project Healthy Schools, Yarducopia, Island Grown Schools) (14.3%), three were school administrators (7.14%), three were other school staff (e.g., garden educator) (7.14%), two were community volunteers (4.76%), and two were other support organizations (i.e., MarinSEL, University of Idaho Extension) (4.76%).

Table 1 illustrates the various grade level(s) that each high school garden program served. Five respondents indicated that their garden program served all grades levels from Pre-K to 12th grade. Majority of the respondents (25) indicated that their school garden program only served grade levels 9th-12th (59.5%).

Table 1. Grade levels respondents indicated their school garden served, n= 42.

Grade Level	Frequency	Percentage
Pre K / Kindergarten – 5th	5	11.9%
6th-8th		
9th-12th		
6th – 8th 9th-12th	6	14.3%

9th	1	2.4%
10th-12th	3	7.1%
11th-12th	2	4.8%
9th-12th	25	59.5%

Most of the school garden programs were established between 5-10 years ago (Table 2). Seven gardens were established within the past year. The oldest garden established was 20 years ago.

Table 2. Year(s) high school garden program was established, n=42.

Garden Established	Frequency	Percentage
Within the last year	7	16.7%
2 years ago	6	14.3%
3 years ago	8	19.0%
4 years ago	5	11.9%
5-10 years ago	11	26.2%
More than 10 years ago	5	11.9%

Respondents reported having various garden features (Table 3). Most of the garden programs had either raised (85.7%) or in the ground (45.2%) beds in more than one area. Two respondents indicated that they have domestic animals in their garden. Moreover, most of the respondents reported having tool/storage sheds, and compost areas.

Table 3. Various types of features school gardens may have at their high school, n= 42.

Feature	Frequency	Percentage
Pond or water feature	3	7.1%
Interpretive signage	8	19.0%
Automated irrigation system	16	38.1%
Greenhouse	23	54.8%
Domestic animals	2	4.8%
Raised beds in one or more areas	36	85.7%
In the ground in one or more areas	19	45.2%

Planter/pots	16	38.1%
Hydro/aquaponics	12	28.6%
Sinks	18	42.9%
Food prep/kitchen area	8	19.0%
Weather Station	3	7.1%
Compost area	33	78.6%
Worm bins	12	28.6%
Tool shed/storage area	33	78.6%
Outdoor teaching area (benches, tables, seats, gathering area, amphitheater)	22	52.4%
Theme gardens	6	14.3%
Rainwater harvesting	8	19.0%
Solar panels	2	4.8%
Other	5	11.9%

Note: sum of percentage is > 100% because respondents can select more than one answer

Current Practices

The majority of respondents reported that teachers were the ones who used the garden for teaching (Table 4). Also, paid non-school support organization staff used the garden to teach.

Table 4. Illustrates who most often uses the school garden to teach, n=42.

Answer	Frequency	Percentage
Master Gardener	5	11.9%
Parent Volunteers	5	11.9%
College Interns/Volunteers	-	-
School Teachers	34	81.0%
Paid garden coordinators (school staff on payroll)	5	11.9%
Paid non-school support organization staff	9	21.4%
Older students (buddy teaching)	5	11.9%
Other volunteers	-	-
Other (chefs, culinary arts and environmental)	3	7.1%

Note: sum of percentage is > 100% because respondents can select more than one answer

Thirty respondents (71.4%) indicated that primarily a specific department within their school utilized their high school garden program. Departments that primarily use the school garden were: agriculture, environmental, science, health, special education, food service, culinary/home economics, and physical education.

Seventeen respondents reported that their school garden had a specific theme with the most common theme being organic garden. Several respondents also indicated that their garden's purpose was "squashing obesity", "sustainable agriculture", and "healthy eating".

All respondents reported their school garden grew vegetables. Eighty percent of the respondents reported their school garden grew vegetables and herbs. Among other things grown in the garden were: fruit trees or vines, ornamentals, local native plants, or that the garden was a wildlife habitat.

Table 5 illustrates the various ways schools use the produce from their garden. The majority of respondents reported that the produce harvested in their garden was used for consumption during garden time (71.4%). Tasting programs (tasting the produce from garden) were also commonly reported (52.4%). Approximately, 38.1% of respondents reported produce that was donated to: farmers markets, soup kitchens, churches, food pantries, foster homes, homeless shelters, and student foster homes. Twenty-eight percent of respondents reported selling their produce at farmers markets, at fundraisers, in the community, to teachers, and at a veggie stand. Several schools (28.6%) reported giving their produce to the community, staff, students, and home economics class to use for tastings.

Table 5. Illustrates what the edible plants from the school garden are used for, n=42.

Edible plants are used for	Frequency	Percentage
Tasting programs	20	52.4%
Academic study	17	40.5%
Sold to school food service	3	7.1%
Donated to school food service	16	38.1%
Harvested for consumption and eaten during garden time	30	71.4%
Sold (to somewhere other than school food service)	12	28.6%
Donated (to somewhere other than school food service)	14	33.3%
Other	7	16.7%

Note: sum of percentage is > 100% because respondents can select more than one answer

Forty-one respondents reported having food safety protocols. Two respondents stated that their garden programs have all their students obtain food handlers certification. Overall, sanitation was the most reported food safety protocol (e.g.,washing/rinsing produce, wearing gloves, washing hands, etc.).

Respondents were asked if the school cafeteria used the produce from the school garden. Forty-one respondents answered the questions, and sixteen respondents reported that their school cafeteria used the produce from the school garden. Additionally, five said that their school did not, but they want to integrate the produce into their school lunch.

Respondents were also asked if they aligned garden education with marketing/promoting fruit and vegetables in the cafeteria and thirteen respondents said they aligned garden education with promoting fruit and vegetables in the cafeteria.

Respondents were asked if their school garden program was a part of Farm to School programming. Sixteen respondents indicated that their school garden program was a part of the Farm to School programming.

Funding Source

Respondents were asked whether they received funds for their garden program. They could skip the question if they did not receiving funding. Table 6 shows the various ways schools received funding. Respondents received funding or were in the process of receiving funding through: produce sales to the local market/farmers market, writing grants to organizations and foundations, individuals, and PTA match funding.

Respondents also were given the option to list the organizations that they received funding from. A few of the organizations were:

- Davis Farm to School grant
- Florida Restaurant and Lodging Association
- Food for All
- Lowes and Walmart
- Oregon Youth Conservation Corps
- Island Grown Schools
- University of Florida Agriculture Extension

Table 6. Funding sources used by high school garden programs, n=42.

Answer	Frequency	Percentage
School or district funds	16	38.1%
Individual donations	9	21.4%
Community/ business	11	26.2%

donations		
Grants and/ or foundations	26	61.9%
PTA/ PTO funds	2	4.8%
Optional (list funding organization)	10	23.8%
Other	8	19.0%

Note: sum of percentage is > 100% because respondents can select more than one answer

Respondents were asked if any support organizations collaborate with their school garden. Table 7 shows the various organizations that collaborate with school garden programs. Non-profit organizations (47.6%) were the most frequent choice of support organizations for school garden programs, and second most frequent choice was University partnerships (40.5%).

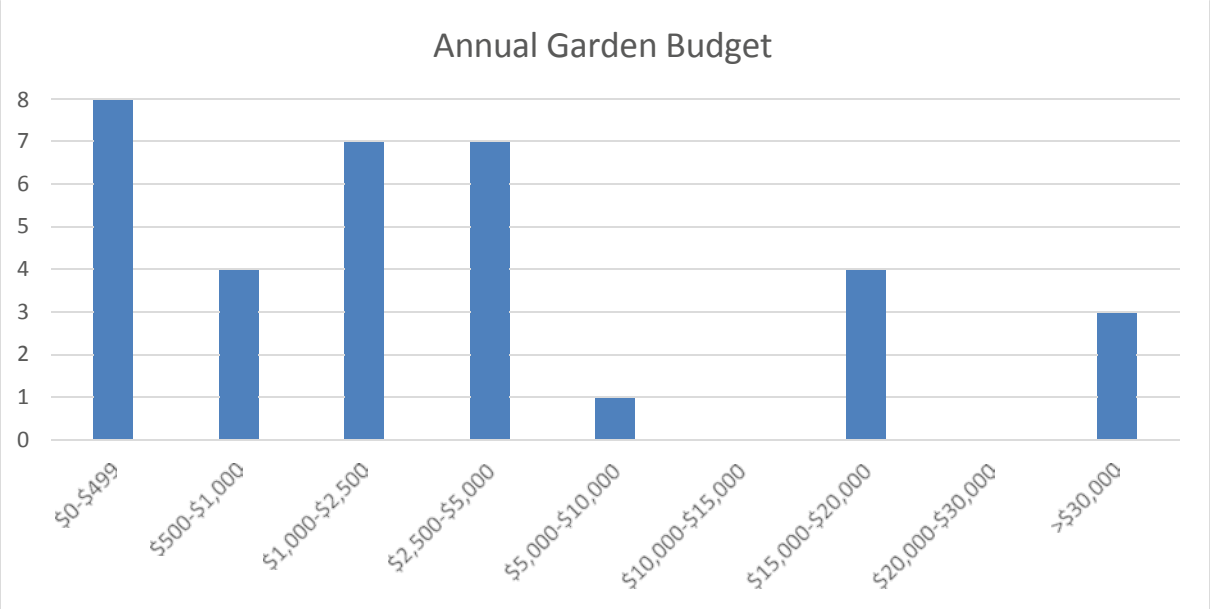
Table 7. Support organizations that collaborate with school garden programs, n=42.

Answer	Frequency	Percentage
Non-profit organizations	20	47.6%
After school programs	3	7.1%
University partnerships (master gardeners, cooperative extension)	17	40.5%
Farms	4	9.5%
Food Corps	3	7.1%
Other	8	19.0%
None	4	9.5%

Note: sum of percentage is > 100% because respondents can select more than one answer
Other: Local nursery, Alger Wellness, Coalition/Sault St. Marie Tribe, Arkansas GardenCorps, George Grown Food Network, Oregon State University Extension, Master Gardeners, FISH Foodbank, PTA, and Whole Foods.

Respondents were asked to report their last academic year's total school garden budget. Figure 2 shows the annual budgets of thirty-eight respondents. Majority of respondents indicated an annual budget between $0-$499.

Figure 2. Total Annual High School Garden Budget within the last academic year, n=42.

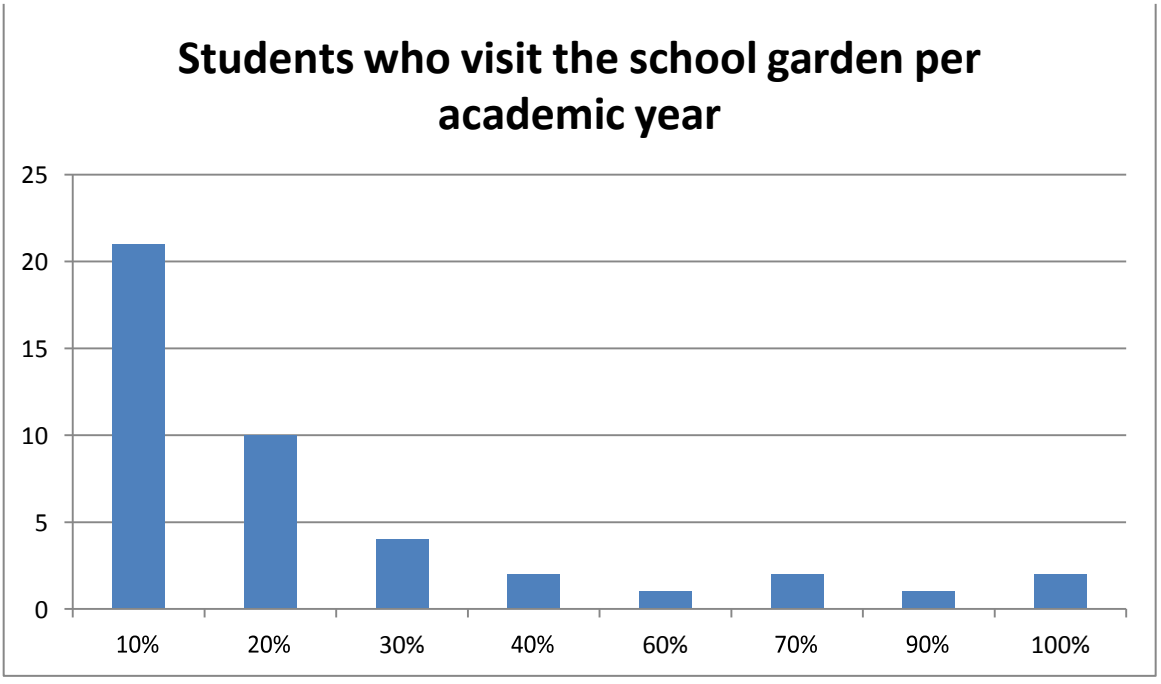


Respondents were asked to indicate how their funds were divided between materials (tools, plants, curriculum, books, hardscaping), maintenance staff, instruction staff, and other items. Respondents could skip questions relating to how their funds were divided up. Respondent's answers for funds towards materials ranged between 2%-100%. Twelve respondents indicated that 100% of theirs funds were towards materials. Several respondents used their funds towards maintenance staff. One respondent indicated that they used 98% of their funds towards maintenance staff compared to six respondents who do not use any of their funds towards maintenance staff. Additionally, some respondents reported using a portion of their funds to instruction staff. One respondent indicated using 100% of their funds. Several respondents reported not using any of their funds towards instruction staff. Also, one respondent indicated that instruction staff funding was embedded into teacher salary. One respondent indicated that 10% of their funding is used to promote the garden.

School garden programs were most commonly used during class instruction time (85.7%). Respondents also reported that the garden was used before (14.3%) and after school (50.0%). Additionally, the school garden was used: on the weekends (28.6%), during summer program/camp (42.9%), and non-school uses (14.3%). One respondent indicated that their school garden was used for the Community Supported Agriculture (CSA) program.

Respondents were asked to indicate the percentage of their school's students that visited the garden (at least once) for formal instruction per academic year. Illustrated in Figure 3, 50% of respondents indicated that only 10% of their student body population visited their school garden. Two respondents reported that their entire student body population visited the garden at least once for formal instruction each academic year. On average, it was reported that students spent approximately two hours in the garden per week.

Figure 3. Percent total student body population that visit the school garden annually, n=42.



Academic Instruction

Respondents were asked if the school garden was used to teach core academic content instruction (English-language, math, arts, science, and social studies). Fifteen respondents indicated that their garden program was used to teach math. The majority of respondents indicated that math skills were reinforced through garden instruction (Table 8).

Table 8. The school garden being used for Mathematics instruction.

Answer	Frequency	Percentage
Math Instruction	15	35.7%
Garden-related mathematics concepts are taught in a lesson prior to or after garden class time	5	11.9%
Math skills are reinforced through garden instruction	12	28.6%
Explicit math lessons are taught in the garden	2	4.8%

Of the 42 respondents, only eleven reported that the garden was used to teach English-Language Arts. Seven of the respondents indicated that English-Language Arts skills were reinforced during garden instruction (Table 9).

Table 9. The school garden being used for English-Language Arts instruction.

Answer	Frequency	Percentage
English-Language instruction	11	26.2%
Garden-related English/Language Arts concepts are specifically taught in a lesson prior to or after garden class time	2	4.8%
English/Language Arts skills reinforced during garden instruction time	7	16.7%
English/Language Arts lessons are taught during garden class time (i.e. journaling, composition, reading, etc.)	4	9.5%

Thirty-six out of 42 respondents indicated that their school garden was used to teach science. As illustrated in Table 10, majority of science concepts were reinforced through garden instruction.

Table 10. The school garden being used for garden-based Science instruction.

Answer	Frequency	Percentage
Science Instruction	36	85.7%
Garden-related science concepts are taught in a lesson prior to or after garden class time	18	42.9%
Science concepts are reinforced through garden instruction	29	69.0%
Explicit science lessons are taught in garden	16	38.1%
Students create and conduct their own science projects in the garden	11	26.2%

Note: sum of percentage is > 100% because respondents can select more than one answer

Furthermore, respondents were asked if their school garden program was used to teach social studies. As shown by Table 11, only eight respondents reported using their garden to teach social studies.

Table 11. The school garden being used for history/social studies instruction.

Answer	Frequency	Percentage
Social Studies/History instruction	8	19.0%
Garden-related history/social studies concepts are specifically taught in a lesson prior to or after garden class time	3	7.1%
History/ social studies concepts are reinforced through garden instruction	5	11.9%

History/ social studies lessons are taught during garden class time	2	4.8%

Respondents were asked to identify which non-core subjects were taught using the school garden program. Table 12 demonstrates which non-core subjects were taught using the school garden program. Health and nutrition was the most common non-core subject being taught using the school garden.

Table 12. Non-core subjects taught using the school garden

Non-core subject	Frequency	Percentage
Agriculture studies	21	50%
Art	8	19.0%
Computer Technology	3	7.1%
Environmental studies	18	42.9%
Foreign language	-	-
Health & Nutrition	26	61.9%
Home economics/ cooking	19	45.2%
Physical Education	9	21.4%
Business/ Microeconomics	4	9.5%
Service learning/ community service	16	38.1%
Other	8	19.0%

Note: sum of percentage is > 100% because respondents can select more than one answer

Respondents reported other non-core subjects taught using the school garden and these included: Culinary arts, Foodservice, Life skills, Photography class, Self-help, Special Education, Work skills, and Teamwork including consensus building, negotiation, compromise, giving/receiving feedback, shared decision making.

Respondents were asked to identify the educational resources and materials they used to teach core academic subjects in the garden. Table 13 shows the breakdown of the resources and materials used to teach core academic subjects. Lesson plans created by respondents and/or

educators were reported as the most frequent resource used to teach core academics. Several respondents indicated that they used garden-based learning publications such as:

- “Florida Harvest of the month”
- “Grow It, Try It, Like It”
- “How to Grow More Vegetables”
- “Natural Awakes”
- “SF Growers Guide”
- “Sprout Scouts”
- “Sunset Western Garden,” and
- “The Growing Classroom, Math in the Garden, Teaching in Nature’s Garden, Life Lab materials”

Websites were also used to help supplement core academic instruction. Websites used by respondents were:

- “Life Lab, National Farm to School Network, National Ag in the Classroom Curriculum matrix”
- “YouTube”
- "Urban Farmer”
- “Square Foot Gardening”
- “Lowes, Home depot,” and
- “Case4learning”

Respondents reported that materials received at workshops or seminar helped teach core academic subjects. Materials used were:

- "Ag in the Garden"
- "Farm to School Program"
- "IFAC"
- "Junior Masters Gardeners 4H," and
- "Variety as needed"

Furthermore, respondents reported that other education resources such as: "cooperative extension handouts, soil testing kits, and teacher-created lessons" were used to teach core academic subjects in the garden.

Table 13. Resources and materials used to teach core academic instruction when the garden is a learning laboratory, n=42.

Resources/ materials	Frequency	Percentage
Textbooks	7	16.7%
Garden-based learning publications	8	19.0%
Lesson plans created by you or other educators	23	54.8%
Websites	8	19.0%
Materials received at workshops or seminars	7	16.7%
Other	5	11.9%

Note: sum of percentage is > 100% because respondents can select more than one answer

Respondents were asked to select three factors/resources that would best support academic instruction in their school garden. Table 14 shows the top three factors/ resources that would best support academic instruction in school gardens: encouragement from administrators to use garden as an instructional tool (50%), teaching training in garden based learning instruction (45.2%), and access to garden-based curriculum/education materials (38.1%). A few

respondents reported that other factors/resources that would support garden academic instruction and those include:

- Garden curriculum geared towards high school students and linked to Next Generation Science Standards.
- Teacher interest in the garden.
- Time/pay for garden management.
- Training for school teachers on garden-based education
- Using the garden as a school club.

Table 14. Respondents suggest factor/resources that would best support academic instruction in the school garden, n=42.

Answer	Frequency	Percentage
Access to garden-based curriculum/ education materials	16	38.1%
Teacher training in garden-based learning instruction	19	45.2%
Teacher training in outdoor classroom management	13	31.0%
Lesson planning time	12	28.6%
Encouragement from administrators to use the garden as an instructional tool	21	50.0%
Other	5	11.9%

Note: sum of percentage is > 100% because respondents can select more than one answer

Respondents were asked if staff members of the garden program had received any garden-based professional development in the past three years. Nineteen respondents reported receiving no garden-based professional development in the past three years. Of the forty-two respondents three respondents reported having on-site school sponsored garden-based

professional development. Table 15 illustrates the garden-based professional development identified by respondents.

Table 15. Respondents that received garden-based professional development within the last three years, n=42.

Answer	Frequency	Percentage
On-site school sponsored	3	7.1%
Off-site workshop	13	31.0%
Conferences or seminars	14	33.3%
Webinars	5	11.9%
Online courses	2	4.8%
None	19	45.2%

Note: sum of percentage is > 100% because respondents can select more than one answer

Respondents were asked to identify what specific professional development topics they would like to attend or like to see offered in their area. Table 16 shows the topics identified by respondents. The top three responses were: youth empowerment and food justice for teens (57.1%), connecting the garden to Next Generation Science Standards (54.8%), and garden enhanced nutrition (50.0%).

Table 16. Professional development topics respondents would like to see attend/see in their area, n=42.

Answer	Frequency	Percentage
Garden enhanced nutrition education	21	50.0%
Connecting the garden to Common Core English Language Arts and Math	20	47.4%
Connecting the garden to Next Generation Science Standards	23	54.8%
English language learning in the garden	9	21.4%
Building a school garden program Fundraising, community building, budgeting, etc.	17	40.5%
Outdoor classroom management	13	31.0%
Garden-based learning in early	7	16.7%

childhood education		
Youth empowerment and food justice for teens	24	57.1%
Gardening how-to's: composting, irrigation, etc.	19	45.2%
Networking events	16	38.1%

Data Collection

Respondents were asked if they were collecting data on their school garden program. Of 38 respondents, 12 respondents said they were currently collecting data on their school garden program, and 26 respondents indicated they do not. Below is a list of various ways school gardens are collecting data:

- FoodCorps Vegetable Preference Survey
- Fruit and vegetable recall surveys.
- Nutritional literacy/ knowledge questionnaire.
- Monthly service reports.
- Interviews and production records.
- Graphing profit that is made, and deciding on how to use funds later.
- Feedback from the community.
- Record weekly how many classes and students are taught in the garden.

Perceived Benefits/Positive Observations

Respondents were asked to identify what positive observations they have made of school garden participants. Approximately 74% of the respondents reported seeing an increase in environmental attitudes in their garden participants. Positive observations also recognized by

respondents were, improvements in health and nutrition (64.3%), increased social skills/behaviors (50%), and increased leadership skills (50%). Increased community spirit, improved attitude towards school, and sense of volunteerism were also noted positive observations (Table 17). One respondent noted the quality of food in the cafeteria increased.

Table 17. Perceived positive observations the school garden program had among students, n=42

Answer	Frequency	Percentage
Increased environmental attitude/attitudes	31	73.8%
Increased community spirit	19	45.2%
Increased social skills/behaviors	21	50.0%
Increased leadership skills	21	50.0%
Improved attitude towards school	18	42.9%
Sense of volunteerism	18	42.9%
Improvements in health and nutrition (i.e., increased fruit and vegetable intake, increased physical activity)	27	64.3%
Improved motor skills	9	21.4%
Academic gains	7	16.7%
Other	1	2.4%

Note: sum of percentage is > 100% because respondents can select more than one answer

Barriers/Negative Observations

Respondents were asked to describe any negative observations made of garden participants. Respondents stated that students did not want to get dirty, or that they got dirty while in the garden. Respondents also indicated that it was a struggle to keep up with the garden maintenance. Moreover, a few respondents noted that they did not have any negative observations of participants. Below list several negative observations observed in the school garden by respondents:

- Maturity level and caring issues affect how the garden is treated.
- Students opposed to redundant garden tasks such as pulling weeds.
- The garden has not improved attendance.
- Difficulty in managing classroom behavior in an outdoor learning environment.
- Race based comments about being in the garden.

Respondents were asked to identify the barriers of having a school garden program. Table 18 shows the barriers most commonly reported with having a school garden program. The top three barriers associated with having a garden identified by respondents were: time constraints (61.9%), lack of funding (54.8%), and lack of staffing (40.5%). Also, reported as being barriers to having a school garden program were: not enough interest in the garden, difficulty linking to core academic standards, lack of volunteers, and lack of garden supplies. Respondents reported other barriers such as:

- Being the only garden coordinator at the high school leaves little time to reach out to teachers to see how the garden can fit their teaching.
- Because there isn't anything explicitly stating "go and garden" in the school's curriculum, there is push back to use the garden
- Deer in the summer
- The ground is frozen during most of the school year (Alaska).
- Teacher is a volunteer.

Table 18. Identified barriers associated with having a school garden program, n=42.

Answer	Frequency	Percentage
Lack of technical assistance with gardening	5	11.9%

Lack of staffing	17	40.5%
Little to no knowledge about a gardening	10	23.8%
Lack of garden supplies	14	33.3%
Lack of funding	23	54.8%
Difficulty linking to core academic standards	10	23.8%
Lack of volunteers	16	38.1%
Not enough interest in having a garden	11	26.2%
Inadequate space	3	7.1%
Time constraints	26	61.9%
Few or no instructional materials	8	19.0%
Other	5	11.9%

Note: sum of percentage is > 100% because respondents can select more than one answer

Implementation

Respondents were asked to briefly describe their implementation strategy, any barriers they encountered, and advice/tips/strategies they have for new garden programs. Below are some answers from several respondents:

Barriers:

- "Keeping urban students interested in gardening."
- "Lack of support during summer months."
- "More funding."
- "Limited staff and volunteers to assist with the upkeep of the garden."
- "I have tried to get the involvement of other members of staff but they are too busy."

Implementation

- "Get the students in the dirt ASAP."

- “Use the entire campus as an opportunity to nurture and improve.”
- “See all soil as opportunity.”
- “Help all the students see all that is living around them: weeds and planted species, how light, water, etc. are to be utilized for plant growth.”
- “Start with less book work and then go to more comprehensive text material.”
- “Student interest needed to be sufficient for initial (and ongoing) enrollment.”
- “A fence to keep the deer out.”
- “A Steering Committee has been formed, the high school woodshop is creating the raised beds. Bylaws and garden guidelines have been written. Beds will be rented to the public for growing food.”
- “Working in a garden also assist students with disabilities in improving their fine and gross motor skills.”
- “Administrative support is critical as well.”
- “It definitely takes at a group of teachers that are dedicated to the garden and the work it involves.”
- “Have a discussion at faculty meeting about health and nutrition. Explain the importance of starting a school garden and the benefits to students and staff.”
- “We had a local church donate and come out and install raised soil bed garden pods.”
- “Local urban garden program help us with installation of the hydroponics garden.”
- “I chose to only use non-GMO plants.”
- “We focused on entrepreneurial education and have assisted students in becoming market gardeners…the school site is used as a demonstration site to teach new students to enter the market gardening business.”

Sustainability

Respondents were asked to briefly describe their sustainability strategy, any barriers they encountered, and advice/tips/strategies they have for new garden programs. Below are some answers from several respondents:

Barriers:

- "No one to water the garden in the summer."
- "Administration does not want students who are in summer school to go out and water, because of supervision concerns."
- "Start-up effort and cost, and identifying ongoing staffing momentum from the program."

Sustainability:

- "As a major component of the Agriculture Science program, ensuring the sustainability of the garden was easy."
- "Our sustainability process is using what is available this year, potatoes, YouTube how-to videos, and greenhouse."
- "We harvest our own soil out of the garden, and composting."
- "Must have consist year-to-year staffing.
- "Garden is a part of agriculture class, teacher is on an extended program to maintain the garden."
- "Network with anyone and everyone… and capitalize on each kid's skills."

- “Market sales of produce are the means of continuing the program and is what drives the recruitment of new students into the project.”
- “Our garden group chooses what we need to extract from the beds and what we need to control. We then follow through with our decisions and make things happen.”
- “Our goal is to include as many special education and general education teachers and students as possible in gardening activities.”
- “Keeping a coordinator at the high school sustains the program.”
- “Agriculture education in high school maintains oversight for the entire garden areas including demonstrative/learning garden.”
- “I asked the school custodians to help out with the maintenance of the garden.”
- “Using the right soil, and the right plants.”
- “Boys and Girls scouts will help with the weeding and watering. Classes will plant before school year is over. Community partners will volunteer over the summer for weeding, watering, and harvesting.”

Chapter 5- Discussion

The first part of this section will describe general information about high school garden programs found across the United States. The second part of the discussion will describe the overall findings of the current practices, barriers, and perceived benefits associated to having a high school garden program. The second discussion part is divided into four sections: current high school garden practices; perceived benefits associated with having a school garden program; barriers associated with having a school garden program; and perceived implementation and sustainability strategies associated to having a garden program.

General Information/Location of High School Garden Programs

As shown in Figure 1 high school garden programs represented in this study were from each region of the United States. The majority of the respondents came from the West, East and South regions of the United States. In contrast, the Mountain West region was represented only by one state. Nearly, 36% of the schools represented in this study were located in urban neighborhoods, and 92% of the schools were public institutions.

This study's objective was to identify high school garden programs across the United States. A study conducted by Blair (2009) revealed there were no quantitative studies and only two qualitative studies on high school gardens programs. The results from this study indicated that 25 respondents had garden programs that only served grades 9^{th}-12^{th}. Most of the garden programs in this study have been established for 5-10 years.

School garden features most commonly identified were raised and in ground beds, tool shed/ storages, and compost bins. All respondents reported growing fruits in their garden, and some had specific themes geared towards obesity, healthy eating, and sustainable agriculture.

Current Practices

Approximately 81% of the respondents were teachers who taught using the school garden. This is probably due to convenience of already being on school property, and a part of the learning environment. Respondents reported that specific departments in the school used their school garden program. Survey results indicted special education; science, agriculture, and physical education were the primary departments that used the school garden. These departments make sense as a garden can easily be integrated into class curriculum. Additionally, this may help with sustainability concerns as having a specific department use the garden could bring garden maintenance under the responsibility of that department. Integrating a school garden program within a specific department may also help with student, teacher, and administrator interest.

Food safety protocols were an important component for each high school garden program. Some respondents reported that their students were required to obtain food handlers certifications which could help the students secure employment outside of school.

Farm to School connects schools with local farms with the objective of serving healthy meals in school cafeterias, improving health and nutrition education, and supporting farmers nationwide. Only 16 respondents indicated they were a part of Farm to School network. Seventy-one percent of the respondents reported that the produce from the school garden was often consumed during garden time and tasting programs (52.4%). Moreover, respondents stated that they gave the produced harvested from the garden to the community, staff, and students to take home. However, only sixteen respondents indicated that they aligned garden education to promoting/ marketing fruit and vegetable in the school cafeteria.

Funding has been a key component to the implementation and sustainability of garden programs. A study conducted by Hazzard, Moreno, Beall, and Zidenberg-Cherr (2011), reported the best practices for creating, sustaining, and utilizing a school garden required people, funding sources, materials, and instruction. In this study, majority of the respondents received funding from grants and/ or foundations, and several also indicated they received school or district funds to help run their garden program. Non-profit organizations also collaborated with school garden programs for added support in implementation and sustainability.

In a study conducted by Graham and Zidenberg- Cherr (2005), nearly 70% of the teachers in the study expressed the most challenging aspect in having a garden for academic instruction was time. More than half of the teachers expressed that teachers' lack of interest, experience, and knowledge in gardening, and a lack of curricular materials linked to academic requirements were also barriers to using school gardens for academic learning (Graham & Zidenberg Cherr, 2005). Results from this study show that the three factors/ resources that would best support academic instruction in their school garden program would be: encouragement from administrators to use garden as an instructional tool, teacher training in garden-based learning instruction, and access to garden-based curriculum/ educational materials. Results from this study support the claim made by Graham and Zidenberg-Cherr (2005) in that there is a lack of knowledge and curriculum materials for academic learning. Additionally, results from this study showed that a garden curriculum geared toward high school students and linked to Next Generation Science standards may support academic instruction.

Respondents in this study stated that the school garden was used for academic instruction in various core subject areas such as: English, math, science, and social studies. This is consistent with a research study conducted by Williams and Dixon (2013) that examined the impact of

garden-based learning on academic achievement in schools in which they found garden-based learning had a positive impact on several core subjects such as science, math, language arts, and social studies.

Majority of respondents indicated that the school garden program was primarily used for science instruction. Among non-core subjects, agriculture studies were frequently taught using the school garden. One respondent reported that their school garden program was used primarily by special education students to teach them life skills. Several respondents reported using garden-based learning publications to help them teach core academic subjects in the garden when it is used as a learning laboratory.

Only twelve respondents indicated that they were collecting data on the impact of their school garden program. Several respondents stated they collected data through surveys, questionnaires, and interviews. The reason for less participation in data collection among respondents may be due to the time constraints or lack of knowledge on how to conduct evaluation. It is important to understand if a program is effective and efficient, thus data collection is an important aspect in learning what works and what doesn't work in the program. Evaluating a program's effectiveness is essential as it may show potential funders, and/or stakeholders that the program is accomplishing its intended objectives.

Perceived Benefits/ Positive Observations

Perceived benefits were identified by asking respondents to indicate what they thought were the benefits of having a school garden program. As shown in previous research, benefits associated to having a school garden program have the potential to increase fruit and vegetable consumption, increase physical activity, and literacy in academic core subjects. Respondents

indicated that they most frequently saw an increase in environmental attitude and improvements in health and nutrition. This is consistent with previous research conducted by Parmer, Salisbury-Glennon, Shannon, and Struempler (2009) showing students who received nutrition education and gardening were more likely to choose vegetables during lunch than students that only had nutrition classes.

Moreover, increased social skills/behaviors, leadership skills, community spirit, and improve attitude towards schools were also reported as positive observations and benefits to having a school garden program. There are few studies evaluating effectiveness of garden-based education on student achievement; however, only seven respondents reported seeing academic gains among their students.

Barriers/ Negative Observations

Respondents were asked to describe any negative observations among the garden participants. Several respondents noted that students did not want to get dirty while in the garden program and that it was difficult to manage classroom behavior in an outdoor learning environment. Moreover, one respondent reported that students were opposed to doing redundant tasks in the gardening like pulling weeds and one respondent indicated that maturity level and caring issues affect how the garden is treated. If student do not feel connected to the environment or have negative connotation about being in a garden, they may mistreat or disregard the learning environment. However, many respondents also indicated that they did not observe any negative outcomes in their students participating in the garden.

The top three reported common barriers associated with having a school garden program are time constraints, lack of funding, and lack of staffing. This is consistent with previous

research studies indicating lack of time, funding and staffing were common reported barriers to having a school garden program (Graham & Zidenberg Cherr, 2005; Hazzard, Moreno, Beall & Zindenberg-Cherr, 2011; Murakami, Pharr & Bungum, 2016**;** O'Callaghan, 2005).

Implementation

Respondents were asked to describe their implementation strategy and any barriers they encountered with starting their garden program. Lack of support during the summer months was an identified barrier. As mentioned previously, the lack of funding associated with having a school garden program can hinder or delay the progress of any new garden program. While each implementation strategy is specific to each garden program, knowing what works for various types of garden programs across the United States can help high schools that are interested in starting their own garden program.

Based on responses in this study, implementation of a school garden program should start small and be built up. Also, getting students involved in the process from the beginning can help sustain the garden. Having a discussion with faculty about the importance of health and nutrition and relating it the benefits of having a school garden is a way to help build support. Respondents reported that teacher buy in is important for the implementation and sustainability of a garden program.

Sustainability

Similarly to implementation, sustainability comes with support, time, and funding. One respondent noted that their agriculture science program integrated the school garden program to ensure sustainability of the garden. Another respondent noted that including as many general education and special education teachers and students in the gardening activities can help the

school garden succeed. Additionally, having consistent year-to-year staffing may help achieve sustainability of a school garden program. Previous research conducted by Antolin (2015), shows that sustainability of high school garden programs was due to strong community and student involvement during spring and summer months. As mentioned previously, collaborating with organizations can help provide support to the school garden program.

School gardens have been around since the early 1890's. Historically, school gardens were intended to teach students about nature and the various life cycles. Over the past two decades, school gardens have become a growing movement across the nation. The nutritional changes and food options made available to students throughout their school day has been related to the rise in obesity among adolescents. School garden programs have been shown to improve dietary behaviors, improve health, and increase nutrition literacy at the elementary and middle school levels. However, little research has been conducted on school garden programs at the high school level. This study identified the current practices, barriers and perceived benefits associated with having a high school garden program in addition to implementation and sustainability strategies for high school garden programs. Although this study had a relatively small sample size, it provided important information that can be used by teachers, administrators, non-profit organizations, and garden proponents seeking to create or maintain a successful high school garden program in their state.

Recommendations from this an previous studies posit that it is important to increase the professional development and garden-based educational resources for teachers and administrators who seek to implement and sustain a high school garden program. Respondents from this survey have a desire to learn more about how to integrate a garden-based curriculum into their class; however, data shows that teachers do not receive much professional

development. It is important to provide this development….. Moreover, the results from this study show that science is the core subject most often taught using the garden as an outdoor learning environment. Additionally, non-core subjects taught in the garden were agriculture studies, environmental studies, and health and nutrition. When high school garden programs are used primarily by a specific department within the school it helps to improve garden sustainability. Findings from this study can be helpful for teachers, administrators, or non-profits hoping to add a school garden program in a high school.

Chapter 6- Limitations

The primary limitation to this study was the relatively small sample size. For this reason, these findings cannot be generalized to the broader school garden community. This study was also limited due to several Farm to School State Leads conducting their own garden research survey causing some to be reluctant to ask their network to take an additional garden survey. Another limitation was that some schools were well established while others had just begun their implementation phase. This can cause some respondents to have more detailed answers than those respondents who came from schools with less established gardens. Additionally, there may have been selection bias in that teachers or administrators who are more interested in their school garden program were more likely to participate in the survey. The answers provided were self-report which may have resulted in self-report bias. Lastly, the length of the survey may have contributed to high percentage of incomplete surveys.

Chapter 7- Recommendations

Since there is a lack of research regarding high school garden programs, researchers may need to focus on this area for future studies. Having data to show the benefits and limitations of garden programs would be beneficial for garden proponents that wish to implement or revitalize existing garden programs in their state. There is also a lack of research focusing on the benefits of school garden programs at the high school level, thus potentially making them less attractive to school administrators and teachers that may be reluctant to start a garden program at their school. In this section, recommendations for teachers, non-profit organizations, school administrators, and garden proponents to better develop and successfully implement high school garden programs are presented. Recommendations for modifying this survey are also recommended. The recommendations given are based on this study and previous research.

As shown in previous research and in this study it is important to establish a small and manageable plan to implement a school garden program. It is important to develop a plan prior to implementing a school garden, and it is critical to have the support of the school administrators. Sustainability may become an issue for all school garden programs at any grade level. As previous research has shown, sustainability is an issue during school breaks, when teachers, administrators, and students are not on campus (Antolin, 2015). The results of this study indicated keeping a coordinator at the high school can sustain the garden, and also asking the school custodians to help out with the maintenance of garden can contribute to sustaining the school garden.

The high school learning environment is different from the elementary and middle school environment in such a way that high school curriculum is more structured than primary schools.

There is less flexibility in lesson plans at the high school level compared to elementary and middle school (Fang, 1995). However, it may be possible to integrate the garden into specific curriculum such as science or agriculture, making the garden sustainable at the high school level. Based on the findings of this study, gardens used primarily by a specific department were more successful in terms of sustainability than those who were not. This may be due to the continued support from the teachers and students within the department.

Based on this study's findings and previous research, funding is one of the biggest barriers associated with having a school garden program (Hazzard, Moreno, Beall & Zindenberg-Cherr, 2011). Ways to overcome the funding gaps could be to apply to federal grants to offset some of the bigger costs to having a school garden. Another notable barrier is the time constraints to maintaining the garden (Murakami, Pharr & Bungum, 2016). As shown by this study, collaborating with non-profits can help with maintenance of the garden during school breaks and they can also be a source of extra financial support. Asking for volunteers and community members to help out with maintenance is another great way to getting more people involved in the school garden.

Furthermore, based on this study's findings and previous research, teachers do not receive garden-based professional development; however respondents wanted more educational resources available to them (Murakami, Pharr & Bungum, 2016). It may be possible that resources are not made available to them because there is a lack of knowledge about where to find the resources. Non-profit organizations, conferences, workshops, and seminars are available to those interested in learning more about garden based curriculum and garden implementation and sustainability.

Modification to Survey

Based on the findings, I would suggest the following modifications be made to the survey:

- Ask respondents to indicate if they serve more than one school. In the event the participant is a garden coordinator that manages multiple schools, they will be able to indicate this.
- The order of questions is critical. Ask about current practices first rather than last. If the survey is too long respondents may not want to complete the survey.
- Include more open–ended questions regarding implementation and sustainability.
- Be more specific with the barriers and benefits questions. For example, ask why they feel that this is a barrier or benefit.

Appendix

Survey Tool

2017 High School Garden Survey

High School Gardens Program Across the Nation: Current Practices, Benefits, Barriers, and Resources Investigator(s) and Contact Phone Number: Jennifer Pharr, PhD. (702) 895-2006 The purpose of this study is to describe educators' perspectives about high school gardening programs across the nation, including their current practices in the garden, benefits associated with having a school garden, barriers encountered with implementation and sustainability of a school garden, and resources needed to implement and sustain a school garden. You are being asked to participate in the study because you meet the following criteria: You have direct involvement in a high school garden program. If you volunteer to participate in this study, you will be asked to do the following: Complete 48 questions (including text entry) on-line survey regarding your school garden program. This study includes only minimal risks. The study will take approximately 30 minutes of your time. You will not be compensated for your time. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact the UNLV Office of Research Integrity – Human Subjects at 702-895-2794, toll free at 877-895-2794, or via email at IRB@unlv.edu. Your participation in this study is voluntary. You may withdraw at any time. You are encouraged to ask questions about this study at the beginning or any time during the research study. Participant Consent: I have read the above information and agree to participate in this study. I am at least 18 years of age. A copy of this form has been given to me (click on link below to download consent). Informed Consent Information Sheet High School Garden Survey If you agree to participate in this survey, select Yes to continue.

- ❍ Yes (1)
- ❍ No (2)

#SkipLogicDescription

Does your school have a garden or garden program?

- ❍ Yes (1)
- ❍ No (2)

#SkipLogicDescription

Does your school garden serve high school students?

- ❍ Yes (1)
- ❍ No (2)

#SkipLogicDescription

What is your role in supporting the school garden?

- ❍ Teacher (1)
- ❍ Community Volunteer (2)
- ❍ School Administrator (3)
- ❍ Other School staff (e.g. Garden Educator) (4)
- ❍ Parent Volunteer (5)
- ❍ Non-profit Support Organization (please specify) (6) _____
- ❍ Other Support Organization (please specify) (7) _____

Where is your school garden located?

City (1)
State (2)
Zipcode (3)

What is your school type?

- ❍ Public (1)
- ❍ Private (2)

School Enrollment (Best estimate)

What best describes the neighborhood your school is in?

- ❍ Urban (1)
- ❍ Rural (2)
- ❍ Suburban (3)

What grades does your school garden serve? (please select all that apply)

- ❑ Pre K/ Kindergarten - 5th (1)
- ❑ 6th - 8th (2)
- ❑ 9 (3)
- ❑ 10 (4)
- ❑ 11 (5)
- ❑ 12 (6)

When was your garden established?

- ❍ Within the last year (1)
- ❍ 2 years ago (2)
- ❍ 3 years ago (3)
- ❍ 4 years (4)
- ❍ 5-10 years ago (5)
- ❍ More than 10 years ago (if more than 10 years please provide a number) (6)

  _____

Is your school garden primarily used by a specific department?

- ❍ Yes (please specify which department) (1) _____
- ❍ No (2)

What types of plants exist/will be grown in your school garden this academic year? (select all that apply)

- ❑ Vegetables (1)
- ❑ Herbs (2)
- ❑ Fruits (trees or vines) (3)
- ❑ Ornamentals (such as flowers) (4)
- ❑ Nuts (5)
- ❑ Local Native Plants (6)
- ❑ Wildlife Habitat (7)
- ❑ Other, please specify (8) _____

Does your garden have a specific theme?

- ❍ Yes, please specify (1) _____
- ❍ No (2)

What is done with the edible plants grown in the garden? (select all that apply)

- ❑ Use produce in tasting programs (e.g., cafeteria tasting) (1)
- ❑ Used for academic study (2)
- ❑ Sold to school food service (3)
- ❑ Donated to school food service (4)
- ❑ Harvested for consumption and eaten during garden time (5)
- ❑ Sold (to somewhere other than school food service) Please specify where (6)

  _____
- ❑ Donated (to somewhere other than school food service) Please specify where (7)

  _____
- ❑ Other, please specify (8) _____

What kind of food safety protocols do you use in handling produce, if any?

What features does your school garden have? (select all that apply)

- ❑ Sinks (1)
- ❑ Food prep/ Kitchen area (2)
- ❑ Weather station (3)
- ❑ Compost area (4)
- ❑ Worm bins (5)
- ❑ Tool shed/storage area (6)
- ❑ Outdoor teaching area (benches, tables, seated, gathering area, amphitheater, etc.) (7)
- ❑ Theme gardens (8)
- ❑ Rainwater harvesting (9)
- ❑ Solar panels (10)
- ❑ Pond or water feature (11)
- ❑ Interpretive signage (12)
- ❑ Automated irrigation system (13)
- ❑ Greenhouse (14)
- ❑ Domestic animals (15)
- ❑ Raised beds in one or more areas (16)
- ❑ In the ground in one or more areas (17)
- ❑ Planters/pots (18)
- ❑ Hydro/Aquaponics (19)
- ❑ Other features not listed, please specify (20) _____

When is the school garden used? (select all that apply)

- ❑ During class instruction time (1)
- ❑ During recess (2)
- ❑ During lunchtime (3)
- ❑ Before school (4)
- ❑ After school (5)
- ❑ Weekends (6)
- ❑ Summer program/camp (7)
- ❑ Non-school community uses (8)
- ❑ Other, please specify (9) _____

What percentage of your school's students do you estimate visit the garden (at least once) for formal instruction per academic year?

- ❍ 10% (1)
- ❍ 20% (2)
- ❍ 30% (3)
- ❍ 40% (4)
- ❍ 50% (5)
- ❍ 60% (6)
- ❍ 70% (7)
- ❍ 80% (8)
- ❍ 90% (9)
- ❍ 100% (10)

On average how many hours per week does your students spend in the garden?

- ❍ 1 hour (1)
- ❍ 2-3 hours (2)
- ❍ 4-5 hours (3)
- ❍ 6-7 hours (4)
- ❍ 8-9 hours (5)
- ❍ More than 10 hours (6)

Who most often teaches students in the garden?

- ❑ Master gardeners (1)
- ❑ Parent volunteers (2)
- ❑ College interns/volunteers (3)
- ❑ School teachers (4)
- ❑ Paid garden coordinators (school staff on payroll) (5)
- ❑ Paid non-school support organization staff (not on school payroll, e.g. non-profit, after school, or cooperative extension staff) (6)
- ❑ Older students (buddy teaching) (7)
- ❑ Other volunteers (8)
- ❑ Other, please specify (9) _____

Is the school garden used for core academic content instruction? (Math, English-Language Arts, Science, Social Studies)

- ❍ Yes (1)
- ❍ No (2)

Is the school garden used to teach math?

- ❍ Yes (1)
- ❍ No (2)

Display This Question:

If Is the school garden used to teach math? Yes Is Selected

How would you characterize garden-based math instruction at your school? (Select all that apply)

- ❑ Garden related mathematics concepts are taught in a lesson prior to or after garden class time. (1)
- ❑ Math skills are reinforced through garden instruction. (2)
- ❑ Explicit math lessons are taught in the garden. (3)

Is the school garden used to teach English-Language Arts?

- ❍ Yes (1)
- ❍ No (2)

Display This Question:

If Is the school garden used to teach English-Language Arts? Yes Is Selected

How would you characterize garden-based English-Language Arts instruction at your school? (Select all that apply)

- ❑ Garden-related English/Language Arts concepts are specifically taught in a lesson prior to or after garden class time. (1)
- ❑ English/Language Arts skills are reinforced during garden instruction time. (2)
- ❑ English/Language Arts lessons are taught during garden class time (i.e. journaling, composition, reading, etc.). (3)

Is the school garden used to teach science?

- ❍ Yes (1)
- ❍ No (2)

Display This Question:

If Is the school garden used to teach science? Yes Is Selected

How would you characterize garden-based science instruction at your school? (Select all that apply)

- ❑ Garden-related science concepts are taught in a lesson prior to or after garden class time. (1)
- ❑ Science concepts are reinforced through garden instruction. (2)
- ❑ Explicit science lessons are taught in the garden. (3)
- ❑ Students create and conduct their own science projects in the garden. (4)

Is the school garden used to teach social studies?

- ❍ Yes (1)
- ❍ No (2)

Display This Question:

If Is the school garden used to teach social studies? Yes Is Selected

How would you characterize garden-based history/ social studies instruction at your school? (Select all that apply)

- ❑ Garden-related History/ Social Studies concepts are specifically taught in a lesson prior to or after gardening garden class time. (1)
- ❑ History/ Social Studies concepts are reinforced through garden instruction. (2)
- ❑ History/ Social Studies lessons are taught during garden class time. (3)

Which of the following non-core subjects are taught using the school garden? (select all that apply)

- ❑ Agricultural Studies (1)
- ❑ Art (2)
- ❑ Computer Technology (3)
- ❑ Environmental Studies (4)
- ❑ Foreign Language (5)
- ❑ Health & Nutrition (6)
- ❑ Home Economics / Cooking (7)
- ❑ Physical Education (8)
- ❑ Business/Micro Economics (9)
- ❑ Service Learning/Community Service (10)
- ❑ None of the above (11)
- ❑ Other, please specify (12) _____

What educational resources and materials are used to teach core academic subjects when the garden is a learning laboratory? (select all that apply)

- ❑ Textbooks (specify title) (1) _____
- ❑ Garden-based learning publications (specify title) (2) _____
- ❑ Lesson plans created by you or other educators (3)
- ❑ Websites (specify organizations and addresses) (4) _____
- ❑ Materials received at workshops or seminars (specify seminars and materials) (5) _____
- ❑ Other, please specify (6) _____

Which of the following positive observations have you made in your school garden participants? (select all that apply)

- ❑ Increased environmental attitude/attitudes (1)
- ❑ Increased community spirit (2)
- ❑ Increased social skills/behaviors (3)
- ❑ Increased leadership skills (4)
- ❑ Improved attitude towards school (5)
- ❑ Sense of volunteerism (6)
- ❑ Improvements in health and nutrition (i.e., increased fruit and vegetable intake, increased physical activity) (7)
- ❑ Improved motor skills (8)
- ❑ Academic gains (9)
- ❑ Other, please specify (10) _____

Describe any negative observations that you have seen in your school garden participants.

What are the barriers to using your school garden? (select all that apply)

- ❑ Lack of staffing (1)
- ❑ Little to no knowledge about gardening (2)
- ❑ Lack of garden supplies (3)
- ❑ Lack of funding (4)
- ❑ Difficulty linking to core academic standards (5)
- ❑ Lack of volunteers (6)
- ❑ Not enough interest in having a garden (7)
- ❑ Inadequate space (8)
- ❑ Time constraints (9)
- ❑ Few or no instructional materials (10)
- ❑ Lack of technical assistance with gardening (11)
- ❑ Other, please specify (12) _____

Would you define your school garden as part of Farm to School programming? (Farm to School programs connect schools with local farms with the objectives of serving healthy meals in school cafeterias, improving student nutrition, providing health and nutrition education, and supporting farmers nationwide)

- ❍ Yes (1)
- ❍ No (2)
- ❍ I don't know (3)
- ❍ I hadn't heard of Farm to School until now (4)

Does your cafeteria use produce from the school garden?

- ❍ Yes (1)
- ❍ No (2)
- ❍ No, but they want to (3)
- ❍ I don't know (4)

Do you align garden education with marketing/promoting fruits and vegetables in the cafeteria?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Other, please specify (3) _____

Which three factors/resources would best support academic instruction in your garden? (select up to three)

- ❑ Access to garden-based curriculum/education materials (1)
- ❑ Teacher training in gardening skills (2)
- ❑ Teacher training in garden-based learning instruction (3)
- ❑ Teacher training in outdoor classroom management (4)
- ❑ Lesson planning time (5)
- ❑ Encouragement from administrators to use the garden as an instructional tool (6)
- ❑ Other, please specify (7) _____

In the past three years what types of garden-based professional development has your staff received? (select all that apply)

- ❑ None (1)
- ❑ On-site school sponsored (2)
- ❑ Off-site workshop (3)
- ❑ Conferences or seminars (4)
- ❑ Webinars (5)
- ❑ Online courses (6)

What specific professional development topics would you attend or like to see offered in your area?

- ❑ Garden enhanced nutrition education (1)
- ❑ Connecting the garden to Common Core English/Language Arts and Math (2)
- ❑ Connecting the garden to Next Generation Science Standards (3)
- ❑ English language learning in the garden (4)
- ❑ Building a school garden program: Fundraising, community building, budgeting, etc. (5)
- ❑ Outdoor classroom management (6)
- ❑ Garden-based learning in early childhood education (7)
- ❑ Youth empowerment and food justice for teens (8)
- ❑ Gardening how-to's: Composting, irrigation, etc. (9)
- ❑ Networking events (10)
- ❑ Other, please specify (11) _____

During the last academic year what was your annual TOTAL SCHOOL GARDEN BUDGET (materials and support staff salary/stipend)?

- ❑ I don't know (1)
- ❑ $0 (2)
- ❑ $0-$499 (3)
- ❑ $500-$1,000 (4)
- ❑ $1,000-$2,500 (5)
- ❑ $2,500-$5,000 (6)
- ❑ $5,000-$10,000 (7)
- ❑ $10,000-$15,000 (8)
- ❑ $15,000-$20,000 (9)
- ❑ $20,000-$30,000 (10)
- ❑ >$30,000 (11)

During the last academic year how was your funding divided? (answer in percentages- 10%, 20% etc.). Skip if you don't know or have no funds.

Materials (tools, plants, curriculum, books, hardscaping, etc.) (1)
Maintenance Staff (2)
Instruction Staff (3)
Other (list resource(s) and percentage) (4)

During this and last academic year who has your school garden received funds from? (select all that apply). Skip if you have no funds.

- ❑ School or district funds (1)
- ❑ Individual donations (2)
- ❑ Community/business donations (3)
- ❑ Grants and/or foundations (4)
- ❑ PTA/PTO funds (5)
- ❑ Optional: Please list funding organizations (6) _____
- ❑ Other, please specify (7) _____

During this academic year, what support organizations collaborate with your school garden? (select all that apply)

- ❑ Non-profit organizations (1)
- ❑ After school programs (2)
- ❑ Network for A Healthy California (3)
- ❑ University partnerships (Such as master gardeners, cooperative extension) (4)
- ❑ Farms (5)
- ❑ FoodCorps (6)
- ❑ Other, please specify (7) _____
- ❑ None (8)

In a few sentences please describe your implementation strategy. Please note any barriers encountered, and also include any advice/tips/strategies you would recommend to new garden programs.

In a few sentences please describe your sustainability strategy. Please note any barriers encountered, and also include any advice/tips/strategies you would recommend to new garden programs.

Have you studied/collected data on the impact of your school garden?

- ❍ Yes (1)
- ❍ No (2)

Display This Question:

If Have you studied/collected data on the impact of your school garden? Yes Is Selected

Please indicate how are you are collecting data on your school garden program (e.g., surveys, questionnaires, interviews).

References

About Let's Move. (2016). Retrieved from http://www.letsmove.gov/about

Beckman, L. L., & Smith, C. (2008). An evaluation of inner-city youth garden program participants' dietary behavior and garden and nutrition knowledge. *Journal of Agricultural Education, 49*(4), 11-24.

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

Bucklin-Sporer, A., & Pringle, R. K. (2010). *How to grow a school garden: A complete guide for parents and teachers* Timber Press.

Campbell, A. N., Waliczek, T. M., Bradley, J. C., Zajicek, J. M., & Townsend, C. D. (1997). The influence of activity-based environmental instruction on high school students' environmental attitudes. *HortTechnology, 7*(3), 309.

Centers for Disease Control and Prevention (2011). Fruit and vegetable consumption among high school students--United States, 2010. MMWR. Morbidity and mortality weekly report, 60(46), 1583.

Fang, W. (1995). The case for more high school gardens. *City Farmer Urban Agriculture Notes,*

Flesher Jared. (2010). High school gardening - for credit. Retrieved from http://green.blogs.nytimes.com/2010/03/26/high-school-gardening-for-credit/?_r=0

Graham, H., & Zidenberg-Cherr, S. (2005). California teachers perceive school gardens as an effective nutritional tool to promote healthful eating habits. *Journal of the American Dietetic Association, 105*(11), 1797-1800.

Hayden-Smith, R. (2007). "Soldiers of the soil": The work of the United States school garden army during world war I. *Applied Environmental Education and Communication, 6*(1), 19-29.

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*(5), 409-413.

Hermann, J. R., Parker, S. P., Brown, B. J., Siewe, Y. J., Denney, B. A., & Walker, S. J. (2006). After-school gardening improves children's reported vegetable intake and physical activity. *Journal of Nutrition Education and Behavior, 38*(3), 201-202.

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

Kohlstedt, S. G. (2008). "A better crop of boys and girls": The school gardening movement, 1890–1920. *History of Education Quarterly, 48*(1), 58-93.

Krasny, M., & Doyle Rebekah. (2002). Participatory approaches to program development and engaging youth in research: The case of an inter-generational urban community gardening

program *Journal of Extension, 40*(5), 1-21. Retrieved from https://www.joe.org/joe/2002october/a3.php

Lekies, K. S., Eames-Sheavly, M., Wong, K. J., & Ceccarini, A. (2006). Children's garden consultants: A new model of engaging youth to inform garden design and programming. *HortTechnology, 16*(1), 139-142.

Life Lab, 2014 California School Garden Survey. (2014). Retrieved from http://www.lifelab.org/2013/12/schoolgardensurvey2014/

McAleese, J. D., & Rankin, L. L. (2007). Garden-based nutrition education affects fruit and vegetable consumption in sixth-grade adolescents. *Journal of the American Dietetic Association, 107*(4), 662-665.

Murakami Tomomi, Pharr Jennifer, & Bungum Timothy. (2016). Educators' perceptions associated with school garden programs in Clark county, Nevada: Practices, resources, benefits and barriers. *Journal of Nutrition & Food Sciences*, 6(2) doi:10.4172/2155-9600.1000465

National Agriculture In The Classroom. (2016). Retrieved from https://www.agclassroom.org/get/about.htm

National farm to school network. (2016). Retrieved from http://www.farmtoschool.org/about

Ogden, C. L., Carroll, M. D., Fryar, C. D., & Flegal, K. M. (2015). Prevalence of obesity among adults and youth: United states, 2011-2014. NCHS Data Brief, (219), 1. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/26633046

Ozer, E. J. (2007). The effects of school gardens on students and schools: Conceptualization and considerations for maximizing healthy development. *Health Education & Behavior, 34*(6), 846-863.

Parmer, S. M., Salisbury-Glennon, J., Shannon, D., & Struempler, B. (2009). School gardens: An experiential learning approach for a nutrition education program to increase fruit and vegetable knowledge, preference, and consumption among second-grade students. *Journal of Nutrition Education and Behavior, 41*(3), 212-217.

Pigg, A. E., Waliczek, T. M., & Zajicek, J. M. (2006). Effects of a gardening program on the academic progress of third, fourth, and fifth grade math and science students. *HortTechnology, 16*(2), 262-264.

Pfleger Piage. (2015, Aug 10,). Healthy eaters, strong minds: What school gardens teach kids. Retrieved from http://www.npr.org/sections/thesalt/2015/08/10/426741473/healthy-eaters-strong-minds-what-school-gardens-teach-kids

Robinson-O'Brien, R. (2009). Impact of garden-based youth nutrition intervention programs: A review. *J Am Diet Assoc, 109*(2), 273-280. doi:10.1016/j.jada.2008.10.051

Skinner, E. A., Chi, U., & The Learning-Gardens Educational Assessment Group, 1. (2012). Intrinsic motivation and engagement as “active ingredients” in garden-based education: Examining models and measures derived from self-determination theory. *The Journal of Environmental Education, 43*(1), 16-36.

Story Mary, Nanney S. Marilyn, & Schwartz B. Marlene. (2009). Schools and obesity prevention: Creating school environments and policies to promote healthy eating and physical activity. The Milbank Quarterly, 87(1), 71-100. doi:10.1111/j.1468-0009.2009.00548.x

Sullivan, A. F. (1999). Community gardening in rural regions: Enhancing food security and nutrition. Retrieved from https://eric.ed.gov/?id=ED439862

Trelstad, B. (1997). Little machines in their gardens: A history of school gardens in America, 1891 to 1920. *Landscape Journal, 16*(2), 161-173.

USDA Announces People's Garden School Pilot Program to Promote Garden-Based Learning Opportunities. (2011). US Fed News Service, Including US State News Retrieved from http://www.usda.gov/wps/portal/usda/usdahome?contentid=2011/04/0155.xml

U.S. Department of Agriculture. (2006). *Economic Research Service.* Briefing rooms: Rural population and migration. Retrieved from http://www.ers.usda.gov/briefing/Population/

U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Data File," 2007-08. Retrieved from https://nces.ed.gov/surveys/sass/tables/sass0708_035_s1s.asp

Wells, N. M., Myers, B. M., & Henderson, C. R. (2014). School gardens and physical activity: A randomized controlled trial of low-income elementary schools. *Preventive Medicine, 69*, S33.

Williams, D. R., & Dixon, P. S. (2013). Impact of garden-based learning on academic outcomes in schools synthesis of research between 1990 and 2010. *Review of Educational Research,* 0034654313475824.

Curriculum Vitae

Noehealani Antolin antolinn@unlv.nevada.edu | 702.275.8783

EDUCATION:

University of Nevada Las Vegas- Masters in Public Health, Behavioral Health

Expected Graduation: Spring 2017 GPA: 3.8

Committee Chair: Jennifer Pharr, Ph.D.

University of Nevada Las Vegas- May 2011 Bachelor of Science, Biological Sciences

AFFILIATIONS:

•UNLV School of Community Health Sciences, Masters of Public Health Advisory Board, Committee Member

•UNLV School of Community Health Sciences, Public Health Student Association, Secretary (2014-2016)

AWARDS:

•UNLV School of Community Health Sciences Graduate Student Leadership Recipient, 2015

COMMUNITY SERVICE:

•National Rebuilding Together Day, Team Leader, 2014 & 2015

•The National Institute of Diabetes and Digestive and Kidney Diseases Short Term Research Experience Program for Underrepresented Persons, Chaperone, 2014 & 2015

•Henderson Lead Hazard Control & Healthy Homes Program, Volunteer, 2014

•Southern Hills Hospital, Volunteer, 2013-2014

PUBLICATIONS & PRESENTATIONS:

•Huebner, J., Antolin, N., Obenza, A., & Marquez, E., Outreach Strategies for Community-Based Research with Underserved Populations. Manuscript in preparation.

•Antolin, N., Huebner, J. Healthy Homes for Community Health Workers, Presentation.

•Antolin, N., Macias, E., Wood, R., Crutcher, N. Best practices for working with students at school: The Tutor Perspective, NCCEP/GEAR UP 2014 Annual Conference, Featured presentation.

EXPERIENCE:

INBRE Evaluation Program Coordinator for Southern Nevada, University of Nevada, Las Vegas- January 2017-Present

•Assistant University of Reno with evaluation database, specifically RedCap

•Collect and analyze survey results from all coordinating centers.

•Participate in weekly INBRE meetings.

NIH/NIDDK STEP UP Program Coordinator, University of Nevada Las Vegas- May 2016 to present

•Administrative work.

•Recruitment, promoting program.

•Participating in STEP UP meetings.

•Student Evaluation.

•Mentor and Students coordination during summer months.

•Preparation for the annual STEP UP symposium.

Graduate Research Assistant, University of Nevada Las Vegas –January 2015 to May 2016

•Assessment and accreditation research for the School of Community Health Sciences

•For accreditation purposes: collected, evaluated, and analyzed data to ensure the program is in compliance with CEPH guidelines.

•Recorded and documented student association, assessment, and faculty meetings and events.

•Coordinated, organized and planned an Assessment Summit and Job fair for the School of Community Health Sciences.

•Conducted student focus groups to ascertain information on the need of students in the Master of Public Health Program.

•Provided oversight over Public Health Student Association.

•Developed surveys that were used in assessment and evaluation for the School of Community Health Sciences.

Certified Healthy Homes Specialist and EPA Lead Risk Assessor, University of Nevada Las Vegas- June 2014-December 2015

•Conducted lead based paint inspections and healthy homes assessments and utilized the Healthy Homes Rating System to score hazards identified in the home.

•Provided community capacity building by providing healthy homes training course.

•Conducted and implemented outreach and recruitment strategies to enroll community members from target area.

•Assisted participants with completing program applications through the qualification process.

•Prepared a series of reports used in key decision making by collaborating agency. Reports identified lead and healthy homes hazards in detailed, thus helping collaborating partners make decisions faster.

GEAR UP Academic Tutor, University of Nevada Las Vegas Center of Academic Enrichment and Outreach- June 2013- May 2014

•Assisted teacher with tutoring students on core subjects

•Provided college advising to students and helped prepare FAFSA documents

•Organized and planned college field trips

•Provided guidance and mentorship to students.

•Engaged in community service activities with students at local shelters and food banks

•Encouraged positive attitudes and behaviors in and out of the classroom setting

•Promoted positive work environment with emphasis on strong team work

Pharmacy Technician, Walgreens, Las Vegas- January 2008-2010

•Collect patient prescription forms and input information in database

•Fill and label prescription drugs for the pharmacists to approve

•Cashiering duties, and ensuring that proper medication is sold to correct patient

•Answer patient questions regarding insurance claims and policy questions

•Restock and manage inventory of prescription drugs

•HIPAA compliant

Office Assistant, Addison Construction, Las Vegas- January 2006-2007

•General administrative duties

•Provided exceptional customer service to clients including quoting, writing, and/or assisting with merchandise questions

•Assisted administrative assistant with office procedures to increase workflow

•Office deposits, supply pick up and drop off

•Maintained supply and inventory list

Internship:

Green Our Planet, Las Vegas, 2015-2016

•Project objective: to ascertain effective strategies in implementing and sustaining a high school garden program with the intention of improving healthy eating habits, nutrition knowledge, and physical activity among youth in Las Vegas.

CORE COMPETENCIES and TECHNICAL SKILLS:

Team Building • Report/Document Preparation • Records Management • Data entry • Meeting/Event Planning • Policies/Procedures • High Level Organization • Problem Solving •Technical Writing • Microsoft Word • Excel • PowerPoint • UNLV Qualtrics/Analytics • Adobe Pro • Google Docs/forms

LICENSES:

Healthy Homes Specialists, 22760

EPA Lead Risk Assessor, NV-R-I157019-1

EPA Lead Dust Sampling Technician, IST-0115-NBA-727400

*References available upon request