Cultivating Food, Expanding Minds:

Evaluating Meadville's Garden-based Education Initiative

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Submitted in fulfillment of the senior thesis requirements of the
Department of Environmental Science at Allegheny College
and approved by the senior thesis committee.

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This study describes the effects of a garden-based education initiative at the Meadville Area Middle School in Meadville, Pennsylvania in its ability to influence students' behaviors, attitudes, and knowledge about nutrition, food preparation, gardening and agriculture, and environmental stewardship. This program seeks to empower students through hands-on learning to become better stewards of their bodies and of the environment. Thirty seventh and eighth grade students took part in three lessons as part of the education initiative and completed a pre- and post-survey. The results of this study indicate that minimal exposure (3 lessons in 9 weeks) was not enough to definitively determine if the program can influence and change behavior, attitudes, and knowledge, but they do indicate that further development of the program and use of the revised evaluation process provided could lead to positive outcomes.

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Gardens provide the ability for families, communities, and schools to not only grow food, but also to get outside, to invest in their community, to learn skills, to build friendships, and to ensure a brighter, healthier future. With these benefits, it is no wonder that gardens in schools and communities have been on the rise nationwide in recent years (Blair 2009). This is especially important given that the relationship of our current society with food and nature is broken, and the consequences of this disconnect are vast. Obesity and other health problems, behavioral issues, reduced problem-solving skills, lower academic achievement, lower self-esteem, and depression are on the rise and much research points to poor nutrition and to the lack of environmental engagement as major contributing factors (Charles 2009, Blair 2009, Joshi Azuma & Feenstra 2008). Many schools are taking this into consideration as they begin to incorporate more forms of environmental education into the curriculum. One such form of this experiential learning style, garden-based education, utilizes a garden to meet the need for better nutrition education, while engaging participants outside as they learn to grow their own food. The garden-based education program at the Meadville Area Middle School seeks to empower students through hands-on learning to become better stewards of their own bodies and of the environment. To ensure that the program is effectively able to influence student's behaviors, attitudes, and knowledge, this research project will evaluate the program using student responses collected through surveys. The resulting conclusions made will be used to revise and expand the current program so that its effectiveness in influencing behavior, knowledge, and attitudes in students can be maximized. Garden-based education has been proven as an effective way to connect students with both the food that they grow and with nature; this study seeks to determine if it is effective in the Meadville community as well.

National Trends

An epidemic of health issues in children—physical, mental, and emotional, —is sweeping the nation and startling evidence points to a shorter life expectancy for today's youth due to poor nutrition and sedentary indoor lifestyles (Olshanskly 2005, Morgan et al 2010, Kelder et al 1994, Aune et al 2017). The Centers for Disease Control and Prevention (CDC) reports that the percentage of children that are overweight or obese is too high; as of 2013, 13.7% of adolescents were obese and 16.6% were overweight ("Nutrition…" 2015). In turn, obesity-related diseases (type-2 diabetes, hypertension, cardiovascular disease, nonalcoholic fatty liver disease,

obstructive sleep apnea, asthma, vitamin D deficiency, depression, anxiety, and ADHD), are on the rise as well (McCurdy et al 2010). Sedentary indoor lifestyles are becoming increasingly common, and combined with poor nutrition, there is a clear cause of rising obesity rates in recent years (Feenstra & Ohmart 2012, McCurdy et al 2010). Richard Louv, the celebrated author and researcher, has coined the term "nature-deficit disorder" to explain the costs born of human separation from the natural world (2005). Nature-deficit disorder has been linked not only to the rise in obesity but also to attention disorders, depression, lower academic achievement, reduced problem-solving skills and behavioral issues (Louv 2005, Nahban & Trimble 1994, Charles 2009, Blair 2009, Joshi, Azuma & Feenstra 2008, Torgan 2002, Pirgon & Aslan 2015).

The rise in health issues is directly influenced by societal and technological changes, by a lack of proper nutrition education and outreach and by socioeconomic restraints. Current generations spend more time inside than any other generation before them ("Connecting…" 2015, Clements 2004, Hofferth & Curtin 2006, Louv 2005, McCurdy et al 2010). Today's children and tomorrow's leaders spend, on average, less than thirty minutes outside and more than seven hours in front of a screen each day ("Connecting…" 2015). In a world where everyone has access to entertainment devices, where "stranger danger" prevents children from playing outside unsupervised, where 80% of the nation's population live in urban areas, and where children are not being encouraged to go outside, there is very little stopping this current trend from continuing and growing (Kimbell, Schuhmann & Brown 2009, Pirgon & Aslan 2015, Danks 2010).

Outdoor activity, paired with better nutrition education and increased fruit and vegetable consumption are marked as primary prevention strategies for obesity, but nationwide, only 6.2% of children consume the recommended daily serving of fruit and just 5.8% consume the recommended daily serving of vegetables (McCurdy et al 2010, Kimmons et al 2009). Nutrition education is a vital component to ensure students have all the knowledge and opportunities to live a healthy lifestyle, but in schools, it has been largely ineffective because of academic expectations such as standardized tests, lack of time and curriculum and little to no reinforcement in school lunches (Perera et al 2015). The current nutrition education system is unsuccessful in creating change, but, as will be seen in this study, alternatives to traditional classroom education could help address these issues.

Poor diet does not stop and start at school. Socioeconomic constraints at home contribute greatly to a child's diet and ability to change it. Food insecurity is one of the leading causes of health and nutrition problems in the United States. Fifty million people and nearly eight million households with children are unable to afford nutritionally adequate food (Coleman-Jensen et al 2011, Gunderson & Ziliak 2015, Wells et al 2010). A family's inability to provide their child with sufficient food, due to either lack of funds or lack of knowledge, can have long-term effects on the health of the child for the rest of their life. Research shows that children who are obese or overweight in childhood are more likely to be obese and overweight as adults (Kelder et al 1994, Annie E Casey Foundation 2016, Wells et al 2010). Several federally funded programs, such as SNAP (Supplemental Nutrition Assistance Program), WIC (Women, Infants, and Children), TANF (Temporary Assistance for Needy Families), and the School Lunch and Breakfast Programs provide families with the resources to reduce food insecurity, obesity rates, and poor health. During the 2012-2013 school year, over 50% of American children (over 25 million children) qualified for the Free or Reduced Lunch Program (National Center for Educational Statistics 2013). Children are eligible for this program if their family's income is at or below 130% of the poverty level for free lunches and if their family's income is between 130% and 185% of the poverty level for reduced price lunches (Pennsylvania Partnerships for Children 2016). As these problems keep compounding on each other, the nationwide health crisis continues to grow and children continue to suffer from inadequate nutrition.

Meadville, Pennsylvania

Trends found in Meadville, Pennsylvania mirror the national trends of this epidemic. Nearly 40% of children are obese or overweight and general knowledge about proper nutrition is poor (PA DOH 2013, Waggett & Garrett 2014). A representative from the Community Relations Department at the Meadville Medical Center stated that "locally, one-third of children in the Crawford Central School District region consume high-fat items such as hot dogs, sausage, potato chips or french fries daily" (Allegheny College 2013, 3). In October of 2014, a study was completed that surveyed 231 seventh graders at Meadville Area Middle School to assess their knowledge, behavior, and attitudes toward physical activity, nutrition, and local foods. The data collected from the survey concluded that knowledge was minimal in terms of nutrition and local foods; this correlates with the fact that nutrition, up until this point, had not been a focus of the

middle school curriculum (Waggett & Garrett 2014). Students reported that they were happy with their diet and that they thought it was healthy (it should be noted that this is even though many students stated that they ate out multiple times per week and that their favorite foods were mostly highly processed items). In general, students were dissatisfied with the options provided for school lunches (Waggett & Garrett 2014). When families were asked what stopped them from eating a healthy diet, the top barriers were convenience, time, money, and knowledge and education (Schmitt 2007).

Socioeconomic issues factor into personal and communal access to fresh fruits and vegetables and one's ability to cook and grow healthy foods. According to the American Community Survey, almost a quarter of Meadville residents and nearly 30% of children live at or below the federal poverty line (2015). Consequently, nearly 28% of the Meadville population receives food stamp/SNAP benefits (American Community Service 2015). In the Crawford County School District, 50% of students (nearly 2,000 students) were eligible for the Free or Reduced Lunch Program during the 2015-2016 school year (Pennsylvania Partnerships for Children 2016). Whereas some of these issues are hard to fix on the local scale, solutions such as implementing a community garden and providing classes that cover nutrition, cooking, and gardening can provide needed resources and opportunities for families to improve their overall wellness.

Community Wellness Initiative

Aware of the issues plaguing the nation and the local community, several key Meadville organizations joined forces to address the epidemic of poor health. In 2013, Allegheny College, in collaboration with the City of Meadville, the Meadville Medical Center, the Crawford Central School District, and the Meadville Area Recreation Complex (MARC), launched a series of initiatives to address the issues of food security, proper nutrition, and general wellness in the Meadville community (Allegheny College, 2013). Funded through a pair of grants, the EPA Environmental Education Grant and an anonymous grant from a private Pittsburgh donor, the Community Wellness Initiative (CWI) was born. Meadville's community garden, located at the MARC, was built in 2015 to promote healthy lifestyles. In addition to offering a space for community members to grow their own produce, the garden is being used by the Meadville Area Middle School (MAMS) as an experiential education space. This environmental education

initiative, offered to seventh and eighth graders enrolled in Family and Consumer Science, social studies, and/or science classes offers a hands-on learning experience that works within the existing curriculum to expose students to gardening, cooking, environmental stewardship, and much more.

Environmental Education

Environmental education is a structured multidisciplinary approach created to engage people with the wonders of the natural world and to encourage their stewardship of the planet (Cole 2007, Cassell 2010, Zhou 2012). By definition, it is the study of the intersection between humans and the environment (Zhou 2012), but beyond that, it can allow individuals to explore and take action on environmental issues, promote the development of a sense of place, improve problem-solving skills and increase general knowledge (Dillon 2002, Mygind 2009). Studying and being exposed to the environment offers a unique opportunity for students to look at issues on a global level while making changes at the local level in their community (Brandt 2013, Liddicoat & Krasny 2013). Garden-based education, the pedagogical approach being evaluated in this study, falls under the broad umbrella of environmental education.

Garden-based Education

Garden-based education, as its name implies, utilizes a garden as its focal point for engaging students in an experiential learning setting (Williams & Dixon 2013). Gardens offer spaces for hands-on investigation and learning in many subject areas and for all levels of students; lessons can even be formatted to fit within curriculum standards (DiClaudio, Hughes & Savoca 2013, Ratcliffe et al. 2011, Danks 2010). School garden initiatives have been shown to benefit students in many aspects such as improving academics and behavior management, serving as a recreational outlet, enhancing self-esteem, developing environmental stewardship, and improving food choices (Blair 2009, DiClaudio, Hughes & Savoca 2013, Berezowitz, Bontrager & Yoder 2015). Students that are provided with the opportunity to work and learn in the garden gain invaluable knowledge and are given the opportunity to develop healthy and sustainable attitudes and behaviors (McAleese & Rankin 2007, Evans et al 2012, Skelly & Bradley 2007, Morgan et al 2010, Ozer 2007, Thorp & Townsend 2001).

Opportunities to explore and learn in a hands-on environment are the experiences that will stick with a student the longest and will provide them with the most personal development.

These opportunities are especially important during middle school as students develop critical physical and mental capacities (Sobel 1993). By utilizing the garden as an opportunity to teach students about proper nutrition and to introduce them to gardening and the concept of environmental stewardship, children will be more likely to carry on these attitudes and behaviors into their adult life (Skelly & Zajicek 1998, Pirouzania 2001, Brandt 2013, Pfleger 2015).

Gardening can act as the solution to many problems that American children face today. Garden-based education can help increase knowledge of proper nutrition which would decrease one's risk for other health issues, while also offering the opportunity for people to spend more time outside. Students reap the benefit of increased exposure to the outdoors while gaining skills in and appreciation for the garden. Studies show that being active in the production of one's food promotes and reinforces healthy eating habits (Danks 2010, Wansink, Hanks & Just 2015). As touched on before, the lack of outdoor exposure can contribute to numerous health issues, many of them the same as with the lack of proper nutrition. Garden-based education offers a solution to both major problems highlighted here. As students learn about how to properly fuel their bodies, they are spending more time outside, and, hopefully, gaining an appreciation for the natural world that will make them want to spend more time outside and become more interested in environmental protection.

During the second quarter of the 2016-2017 school year, 97 Meadville Area Middle School students participated in three garden-based education lessons. Students met with Taylor Hinton, the Wellness Programs Coordinator, roughly once per month for an hour, during the nine-week quarter. Activities were chosen and taught by Taylor Hinton to teach the students about nutrition, meal preparation, gardening/agriculture, and environmental stewardship. The first lesson was taught on November 21, 2016. The topic, Seasonality, allowed students to discuss the crops typically grown in Northwestern Pennsylvania and the season-extension methods that can be used to have year-round harvests (greenhouses, hoop houses, etc.). The next two lessons were taught on December 19, 2016, and January 19, 2017. Both dates used an activity called Harvest of the Month that is meant to encourage students to try healthier alternatives to their favorite snack food. Hopefully, it also motives them to try other alternatives outside of class. In December, students prepared Kale Chips and in January, they prepared Parmesan Roasted Carrots.

Goals and Objectives of the Initiative

A set of goals and objectives were pre-determined as part of the EPA grant proposal to make the garden-based education initiative as effective as possible in teaching the Meadville youth. As part of this initiative, the community garden at the Meadville Area Recreation Complex acts as the classroom for students to gain gardening skills and increase their understanding of sustainable land stewardship in terms of growing food on a local level. The program seeks to implement lessons focused on the environmental and human impacts of food and agriculture that meet Pennsylvania state academic standards. On a larger scope, students will become knowledgeable about the role of agriculture in climate change, on water resources, and on human and environmental health, so that they can make informed decisions about their food choices. Finally, the program seeks to encourage behavioral changes that improve the environment and increases environmental stewardship (for more details on the EPA EE Grant contact Kerstin Martin, grant coordinator).

Purpose of Research

Within the existing curriculum at Meadville Area Middle School, garden-based lessons were added as supplementary material during the 2015-2016 school year. Now in the it's second year, the program needs to be evaluated. The purpose of this research is two-fold; it will evaluate the program's ability to effectively influence students' knowledge, attitudes, and behavior, as well as serving as a pilot for a survey that measures these outcomes. A revised version of the surveys will be made available so that data can continue to be gathered in years to come. Research participants will be seventh and eighth-grade students enrolled in the Family and Consumer Science class taught by the Wellness Programs Coordinator, Taylor Hinton, during the nine-week period. The lessons provide students with the opportunity to utilize the garden, cook together, and discuss topics such as food miles, genetically modified foods, sustainability, environmental issues, and general nutrition. The purpose of these lessons is to empower students to make better decisions regarding food purchasing, proper nutrition, and environmental stewardship, as well as providing hands-on experience gardening and preparing food. These aspects combined will also contribute to the student's overall wellness and desire to spend more time outside. Student responses before and after working in the garden will be collected via survey and analyzed to generate a report on the effectiveness of the initiative. Throughout this process, modifications, and suggested changes will be generated to improve the survey for future

use. The hope is that a modified version of the survey will be used for years to come to track long-term effects of the program as it grows.

The garden-based education initiative at the Meadville Area Middle School offers a solution to some of the complex problems that are plaguing today's society. The connection between people, food, and the environment has never been so distant, nor more important. As an invaluable part of the Community Wellness Initiative, this program empowers Meadville's youth to make educated decisions about the food that they are putting in their bodies and to become connected to their food source. School and community gardens put a face on food—connecting students not only to their food but to their community as well—and by bridging this gap between people and food in the Meadville community, the general healthiness of the town should improve.

METHODS

To determine the effectiveness of garden-based education classes at Meadville Area Middle School, surveys were administered to a small sample population of the school. The surveys were created to determine if the intervention was effective in influencing students' behaviors, attitudes, and knowledge in regard to food production, cooking, environmental stewardship, and proper nutrition. The following section provides details on the participants, why, when, where and how the data was collected and how the data was analyzed.

Participants

This study was conducted at Meadville Area Middle School (MAMS) in Meadville, Pennsylvania. Seventh and eighth-grade students enrolled in the Family and Consumer Science (FaCS) class during the second quarter of the 2016-2017 school year (November 4th, 2016 – January 20th, 2017) participated in the survey process. Students in this class were exposed to nutrition and gardening-based lessons in addition to the traditional curriculum. The FaCS class is just one of many disciplines that have incorporated these lessons into their curriculum, but this subject was selected because it offered the biggest pool of students exposed to the same activities. Added as part of the Community Wellness Initiative, the lessons were meant to

influence students' attitudes, behavior, and knowledge. Participant responses were collected from all five FaCS classes to consider the different variables and experiences from class to class. This method of data collection provided the most accurate and comprehensive picture of student response to the class.

Participants in this research project were all under the age of 18 and in a public middle school, so it was necessary to obtain several different permissions. The original timeline for this project had to be delayed until approval was granted by both MAMS school board and the Allegheny College Institutional Review Board. Originally, the pre-survey was scheduled to be administered as close to November 4th, 2016 (the first day of the second quarter)as possible to allow the most time in between pre- and post-surveys, but the survey administration date had to be pushed back until after the November 14th, 2016 school board meeting. At that meeting, the project proposal was presented and, ultimately, approved (Appendix A). The project was approved by IRB on November 22, 2016, with the protocol number 2017-24 after a signed letter from the community partner, the MAMS Principal, was submitted (Appendix B). With these permissions, an informed consent form for parents of the participants was sent home (Appendix C). The signed informed consent form, as well as a signed assent form for students, was obtained before the surveys were administered (Appendix D). Only students who had returned the informed consent forms signed by their parents and who signed their own assent form were eligible to take the survey.

Data Collection

Data was collected through the administration of surveys before and after the garden-based education intervention. It was determined that surveys are the most effective format for the purposes of this study because they can obtain the most direct data on a specific problem and population (Rossi, Freeman & Wright 1979, Smith & Glass 1987). The standardization of questions asked and responses received made the comparison of before and after data collection simple and effective. The use of questions using the Likert Scale and multiple choice allowed for only a finite number of answers which was easier to compile and to compare. The open-ended questions created a space for the participant to answer in their own words which could be invaluable in determining the effectiveness of a program. As compared to other methods of data collection, surveys can collect large amounts of data within a small amount of time. Furthermore,

surveys offer the ability for long-term tracking of change and are easily re-administered and replicated which provides the ability to create stronger correlations between the program and the trends observed (Schuman 2008). Surveys are limiting in that it is impossible to follow up and get more information on an answer after the participant has turned in their survey. Also, students might interpret the questions differently than what was intended so the data collected and conclusions drawn could be misleading. Despite some of the limiting factors, the decision to collect data using surveys was proven through similar studies to be the most efficient and effective for this kind of research (Skelly & Zajicek 1998, Ratcliffe et al 2011, Skelly & Bradley 2007).

The survey was created to determine whether there was knowledge, attitude and/or behavior change through carefully selected and worded questions. The survey questions were created using the goals and objectives for the program as a guide, as well as consulting the format and questions asked as part of the study completed in 2014 that surveyed MAMS 7th grade students and of a survey that was administered by Taylor Hinton, the Wellness Programs Coordinator, at the end of a previous quarter (Waggett & Garrett 2014, Hinton 2016). With a mix of Likert-scale questions and open-ended responses, the survey design was meant to be easily and quickly filled out.

The pre-survey included 4 multiple choice questions, 2 open-ended questions, 4 sections of questions answered using a Likert-type scale and 2 demographic questions (Likert 1967). Multiple choice questions were broken into simple “Yes” or “No” questions and frequency questions with different qualifiers and intervals. The demographic questions asked for grade level and whether they qualified for free or reduced lunches (Appendix E). Grade level was important to record because it allows for a comparison between the two grade levels to determine whether efforts should be redirected or changed for certain ages. It also could allow for the comparison between the current seventh grader's knowledge and the knowledge of seventh graders collected in 2014 before any of the supplementary lessons were added. Obtaining whether students qualified for free or reduced lunch made it possible to determine if there were any correlations between lower income students and their knowledge and health versus higher income students’. The Centers for Disease Control and Prevention (CDC) reports that there is a correlation between low-income families and obesity; obesity disproportionately affects children from low-income families (“Childhood…” 2016). If there is strong evidence to show that this

program is increasing these specific student's knowledge and empowering them to make changes in their lives then the program would be considered effective in that sense. The post-survey included 3 multiple choice questions, 3 open-ended responses and 4 sections of questions answered on a Likert-type scale (Appendix F). Most of the questions remained the same from the pre- and post-survey to determine if there was any change in responses, but 2 of the open-ended responses changed to collect different data before and after the intervention. Comparing the two sets of data allowed for conclusions to be drawn as to the effectiveness of the program.

To ensure student confidentiality, students were only identified by a code written at the top of the survey each time they took it. The code that was used had the participant write their first initial, birth date, followed by the number of siblings they have. While effective in identifying students individually, the codes did not include explicitly identifying information. By using this code, it was possible to not only determine aggregate trends, but also individual change in students. Without this code, it would have been impossible to determine individual change.

The pre-survey was administered on November 21, 2016, by the lead researcher, Darby Anderson. Additional surveys were administered during a make-up period on December 5, 2016, by the Wellness Programs Coordinator. The post-survey was administered on January 20, 2017, to 30 of the original 31 students. Data was not collected from one student because they were absent the day of the survey administration and a make-up session was not able to be arranged. To keep the pre- and post-survey data even, the data collected during the pre-survey from this student was removed.

Data Analysis

To assess the effects of the intervention on behavior, attitude and knowledge change, the pre and post data collected through the surveys was compared to determine any significant differences in responses that might point to the effectiveness of the program. Once the data was collected via the in-person survey, the data was transferred into an Excel document. Data was first inputted into two separate workbooks, one for the pre-survey responses and one for the post-survey responses. To keep the data organized and simple, each question set was recorded on a separate sheet within the workbook. Tables were created that listed the student ID code on the left-hand side with their corresponding response in the next cell. Once all the raw responses were inputted,

the workbooks were copied. The first version served as a backup of the raw data, while the copy was used to code and analyze the data.

In the new workbook, the data was coded to create uniformity of response. The code for the questions answered with the Likert-scale remained the same as the student's response; answers ranged from one to five with an extra category of zero added to account for questions that went unanswered. For yes or no questions, responses were coded zero to three (0 = no answer, 1 = yes, 2 = no, and 3 = sometimes/kind of/maybe). Demographic information was coded similarly. For the questions asking whether students had worked with Taylor Hinton before and if they qualified for free or reduced lunch, responses were coded with a zero for no answer/prefer not to answer, with a one for yes, and with a two for no. For the question regarding grade level, responses were coded simply using a seven for seventh grade and an eight for eighth grade. For multiple choice questions (the question about servings of fruits and vegetables and the question about meal preparation) responses were scored nominally again, with zero being no answer. The open-ended questions were looked at individually for unique or significant statements that support or refute the effectiveness of the program. All written responses were sorted and coded by similar themes to determine trends in opinion, interest, and knowledge. The code was dependent on the number of themes present for each question, but it always started with one and zero always represented any responses that went unanswered.

The coded data was then used to make a pivot chart for each question that displayed the distribution of answers. The distribution of data was further displayed through the calculation of a mean percentage for each question. Additionally, the students' answers for each of the Likert-scale questions were averaged together to determine the mean answer for both before and after the intervention. These means were compared to determine the rate of change that was observed. These calculations were then copied from the separate pre- and post-survey workbooks and pasted into the same workbook with a separate sheet for each question set. With the pre and post data for each question within the same sheet, the rate of change could be analyzed.

The responses were then grouped together using the common themes of nutrition, meal preparation, gardening/agriculture, and environmental stewardship. These data sets were displayed in graphs and tables. For the questions scored using the Likert-scale, tables were created to show the comparison between the average response pre- and post-program. For the

other choose-one questions, graphs were used to show the difference of student responses before and after the program.

A third workbook was created to perform a comparison between the survey responses of students who qualified for free or reduced lunch to the students who did not qualify. Using the demographic question on the pre-survey, the surveys were separated into the two categories. As with the other data sets, mean percentages and mean responses were calculated. The mean responses were compiled into tables. The questions were grouped under common themes: nutrition, local food, gardening/agriculture, and food security. The tables had columns for pre and post mean responses for those students who qualified for free or reduced lunch and for those who did not and columns showing the difference in response. The data was also visually represented using bar graphs. The graphs had three columns per questions representing the total mean student response, the mean response to the students who qualified for the free or reduced lunch and the mean response of the students who did not qualify.

RESULTS

The goal of this study was to determine if the garden-based education program being implemented at the Meadville Area Middle School (MAMS) was effectively influencing seventh and eighth grade students' knowledge, attitudes, and behavior on the concepts of nutrition, gardening/agriculture, and environmental stewardship, as well as to generate a revised version of the assessment surveys that can more accurately and effectively gather data for years to come. Data was collected from 30 of 97 (31%) MAMS students enrolled in the Family and Consumer Science (FaCS) class during the second quarter. 13 seventh grade students, 16 eighth grade students and one student that chose not to answer the question were surveyed during the first 15 minutes of the FaCS class; pre-surveys were administered on November 21, 2016, and post-surveys were administered on January 20, 2017. The effectiveness of the program was evaluated by comparing the responses between the pre- and post-survey in the areas of nutrition, meal preparation, gardening and agriculture, and environmental stewardship. The relationship between free or reduced lunch and student responses was also evaluated.

Nutrition

15 out of 30 students (50%) indicated that they were interested in learning about nutrition before the garden program and 12 out of 30 students (40%) were interested in it after the program (Figure 1). As shown in Table 1, both before and after the program, student response to nutrition-related questions averaged around a 3.3 or 4.3 out of 5, meaning that students were neutral or agreed with the statement given. After the programs, students reported that they want to eat more fruits and vegetables and less fast food. Furthermore, students were less happy with what they ate and felt that they did not eat enough nutritious food. Overall, students agreed that eating healthy is important. Figure 2 shows the student response to the question "on average, how many servings of fruits and vegetables do you eat per day?" Most students, both before and after the program, marked that they ate 2-5 servings. After the program, there was at 27% increase of students who consumed 2-5 servings, as 4 students marked that their consumption of fruits and vegetables increased from 0-1 servings to 2-5 servings per day.

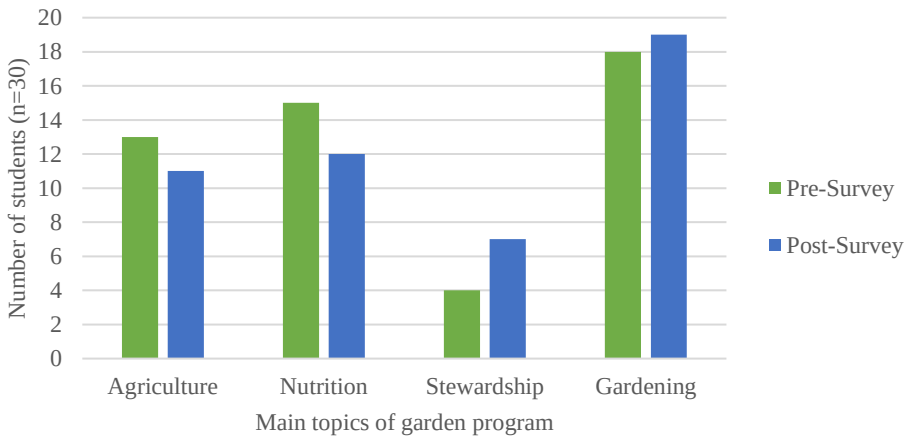

Figure 1. Student interest in the main topics of the garden program at MAMS

Table 1. Comparison of average student response before and after the garden program regarding nutrition-related statements

	Average pre-survey response	Average post-survey response	Difference in response
If I could, I would eat more fruits and veggies	3.6	3.9	+ 0.3
If I could, I would eat less fast-food	3.4	3.3	- 0.1
I feel healthy	4.0	4.2	+ 0.2
I eat enough nutritious food	4.0	3.3	- 0.7
Eating healthy is important	4.3	4.3	0.0

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don't know, don't care, 4 being agree and 5 being strongly agree.

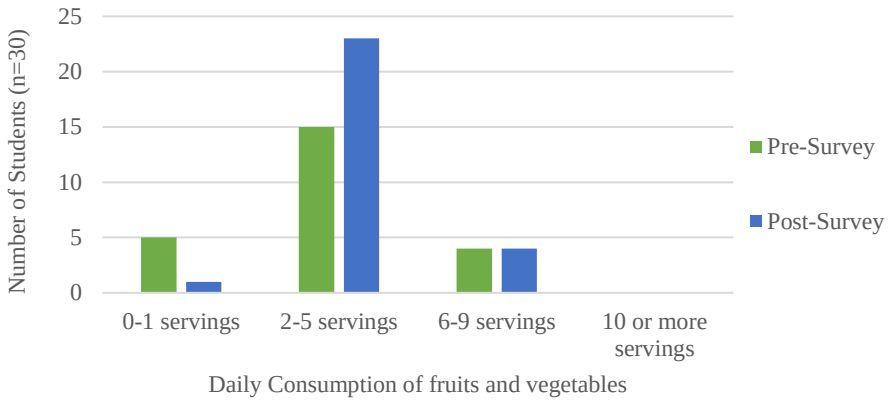

Figure 2. Student responses to the question "on average, how many servings of fruits and vegetables do you eat per day?"

Meal Preparation

When asked about their meal preparation habits with their family, most students reported that they prepare meals together at least 4 times per week (Figure 2). Student responses remained largely unchanged on the pre- and post-survey, but it was found that just one student reported preparing meals "1 or less days per week," as opposed to three students in the pre-survey. Students indicated that they were interested in preparing meals more often alone and with other people (Table 2). When asked on the post-survey if students enjoyed preparing food with their classmates, the answer was extremely high (average response of 4.7 out of 5). 16 students (53%) before the lessons and 19 students (63%) after indicated that they buy organic food on a regular basis. Students were also surveyed on their knowledge and attitudes about local food. Survey results showed that students' perceived knowledge of and interest in local food fell after the program (Table 3). Despite knowledge and interest decreasing, a clear majority of students still indicated that they thought that knowing about and supporting the local food system is important.

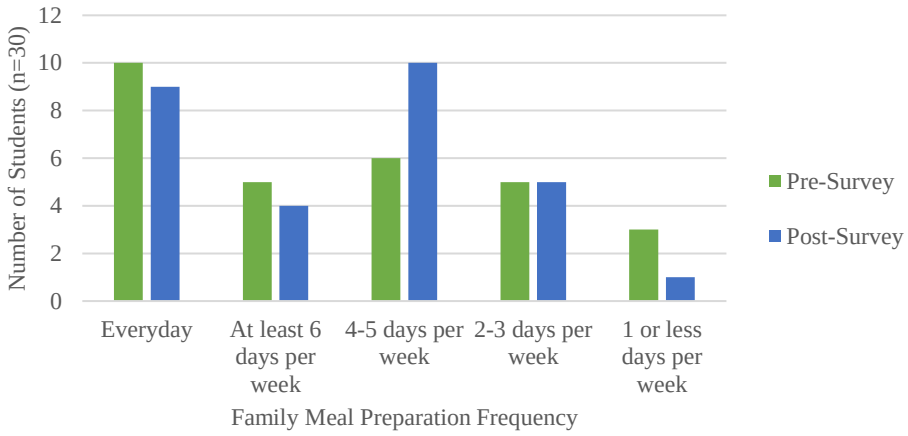

Figure 3. Student responses to the question "in a normal week, how often does your family prepare meals together?"

Table 2. Comparison of average student response before and after the garden program regarding meal preparation

	Average pre-survey response	Average post-survey response	Difference in response
If I could, I would eat more freshly prepared meals	3.6	3.9	+ 0.3
If I could, I would cook my own food more often	3.6	3.9	+ 0.3
If I could, I would spend more time cooking with friends/classmates	3.9	3.8	- 0.1

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don't know, don't care, 4 being agree and 5 being strongly agree.

Table 3. Comparison of average student response before and after the garden program regarding local food knowledge and interest

	Average pre-survey response	Average post-survey response	Difference in response
It is important to know where my food is coming from	3.9	3.8	- 0.1
I know where to get local food	3.6	3.5	- 0.1
If I could, I would buy local fruits and veggies	3.6	3.4	- 0.2

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don't know, don't care, 4 being agree and 5 being strongly agree.

Gardening and Agriculture

As shown in Figure 1, a clear majority of students were interested in learning about gardening above any of the other main topics explored through these lessons. 18 out of 30 students (60%) were interested in learning about gardening before the program and 19 students (63%) were interested after. Student interest in agriculture was not as high, just 43% of students before and 37% after. Students reported that knowledge and interest in gardening decreased after the

program (Table 3). 73% of students thought that hands-on learning in the garden is fun before the program, and only 50% felt the same way after the program. Student response, when asked on the post-survey if they enjoyed learning about gardening and agriculture, was average (3.3 out of 5).

Table 4. Comparison of average student response before and after the garden program regarding gardening knowledge and interest

	Average pre-survey response	Average post-survey response	Difference in response
I feel that I could start my own garden with my family	3.3	3.0	- 0.3
If I could, I would grow my own food	3.6	3.0	- 0.6
Hands-on learning in the garden is fun	4.0	3.2	- 0.8

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don't know, don't care, 4 being agree and 5 being strongly agree.

Environmental Stewardship

By far, students before and after the program were the least interested in learning about environmental stewardship (Figure 1). Most students marked "Don't know, Don't care" or left the question blank when asked about their interest in environmental stewardship (Figure 4). On the pre-survey, 77% of students felt responsible for protecting the environment, compared to 67% that felt this way after the program (Table 5). The same trend was seen when students were asked if they thought that the way food is grown can negatively impact the environment; 57% agreed with the statement before and just 40% after (Table 5). One of the open-ended questions asked students to define in their own words what environmental stewardship meant. Before the program, only six students (20%) could correctly define the word – for this study, student answers that focused on protecting or caring for the environment were accepted as being correctly defined. Two more students correctly defined the word on the post-survey (eight students total for 27%). Of the students who were unfamiliar with the term, the most popular answer was "I don't know" or the question went unanswered. Of the students that responded correctly, key phrases were "helping/caring/protecting the environment," "keeping the environment healthy and clean," "avoiding fertilizers and other bad products," "reduce, reuse, recycle," "environmental awareness," "working with the environment," and "treating our environment with respect."

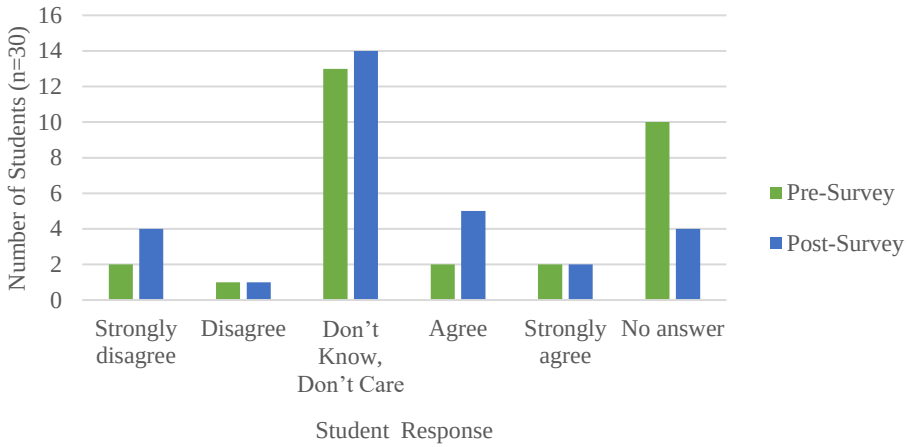

Figure 4. Student response to the question "I am interested in learning about environmental stewardship."

Table 5. Comparison of average student response before and after the garden program regarding gardening knowledge and interest

	Average pre-survey response	Average post-survey response	Difference in response
I think I am responsible for protecting the environment in any way I can	3.8	3.5	- 0.3
I think that the way food is grown can negatively impact the environment	3.6	3.1	- 0.5

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don't know, don't care, 4 being agree and 5 being strongly agree.

Free or Reduced Lunch

Seven students (23%) indicated on the pre-survey that they received a free or reduced lunch (FRL). Overall, student responses of those who qualify for FRL and those who do not qualify did not differ drastically, but differences were observed in certain areas. Students who qualify for the FRL program were slightly less interested in both reducing their fast food consumption and increasing their fruit and vegetable consumption. Responses from FRL students indicated that they do not feel healthy and do not eat enough nutritious food (Table 6 and Figure 5). A substantial difference was observed as FRL students felt that they did not know where to buy local food and they did not want to buy more local food as compared to the responses from non-FRL students (Table 7 and Figure 6). On the topic of gardening, students that qualify for FRL were generally more interested in gardening (Table 8). As compared to non-FRL students, these students were much more interested in growing food for themselves, though knowledge is still low on how to implement a garden (Figure 7). FRL students indicated on both the pre- and post-survey that they were less happy with their diet, felt they had less power to change their diet and agreed more with the

statement “I do not have a choice in what I eat” more than non-FRL students (Table 9). From the pre- to the post-survey, FRL students recorded a substantial change in their perceived power over their diet; after the program, these students felt much more confident that they can change their diet (Figure 8).

Table 6. Comparison of the average student response from those who do not qualify for free or reduced lunch and those students that do qualify for the program before and after the garden program regarding nutrition-related statements

	Pre-Survey			Post-Survey		
	Average non-FRL Response	*Average FRL Response*	*Difference in response*	*Average non-FRL Response*	*Average FRL Response*	*Difference in response*
If I could, I would eat more fruits and veggies	3.7	3.3	- 0.4	4.1	3.1	- 1.0
If I could, I would eat less fast-food	3.5	3.3	- 0.2	3.6	2.3	- 1.3
I feel healthy	3.9	4.4	- 0.5	4.2	4.1	- 0.1
I eat enough nutritious food	4.1	3.6	- 0.5	3.4	3.0	- 0.4
Eating healthy is important	4.0	4.4	+ 0.4	4.1	4.0	- 0.1

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don’t know, don’t care, 4 being agree and 5 being strongly agree.

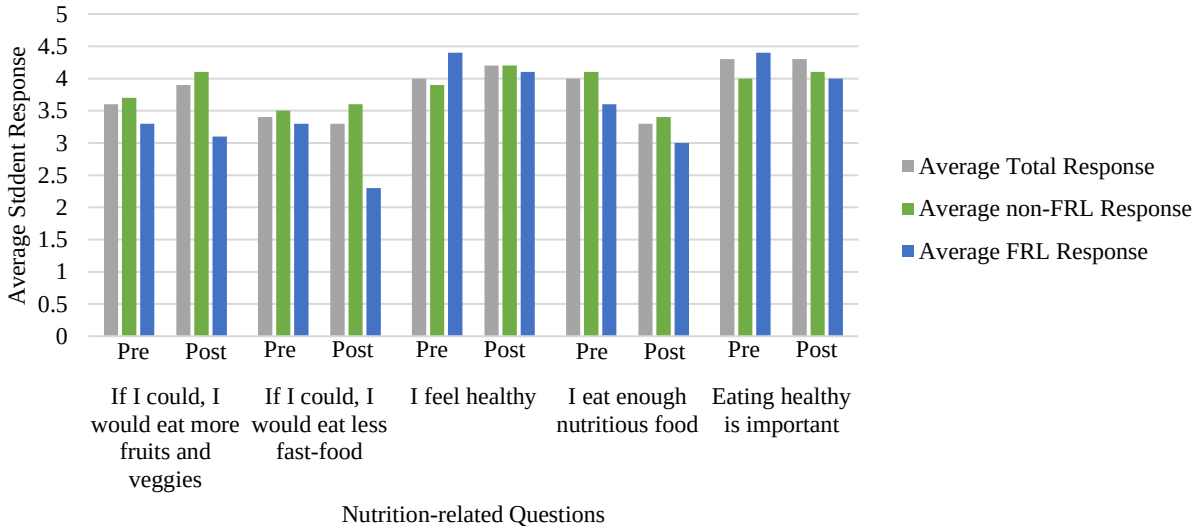

Figure 5. Comparison of Average Response from Pre- to Post-Survey for Nutrition-related Questions

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don’t know, don’t care, 4 being agree and 5 being strongly agree.

Table 7. Comparison of the average student response from those who do not qualify for free or reduced lunch and those students that do qualify for the program before and after the garden program regarding local food knowledge and interest

	Pre-Survey			Post-Survey		
	Average non-FRL Response	*Average FRL Response*	*Difference in response*	*Average non-FRL Response*	*Average FRL Response*	*Difference in response*
It is important to know where my food is coming from	3.9	3.7	- 0.2	3.7	3.7	0.0
I know where to get local food	3.6	3.6	0.0	3.7	2.9	- 0.8
If I could, I would buy local fruits and veggies	3.7	3.4	- 0.3	3.6	3.0	- 0.6

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don't know, don't care, 4 being agree and 5 being strongly agree.

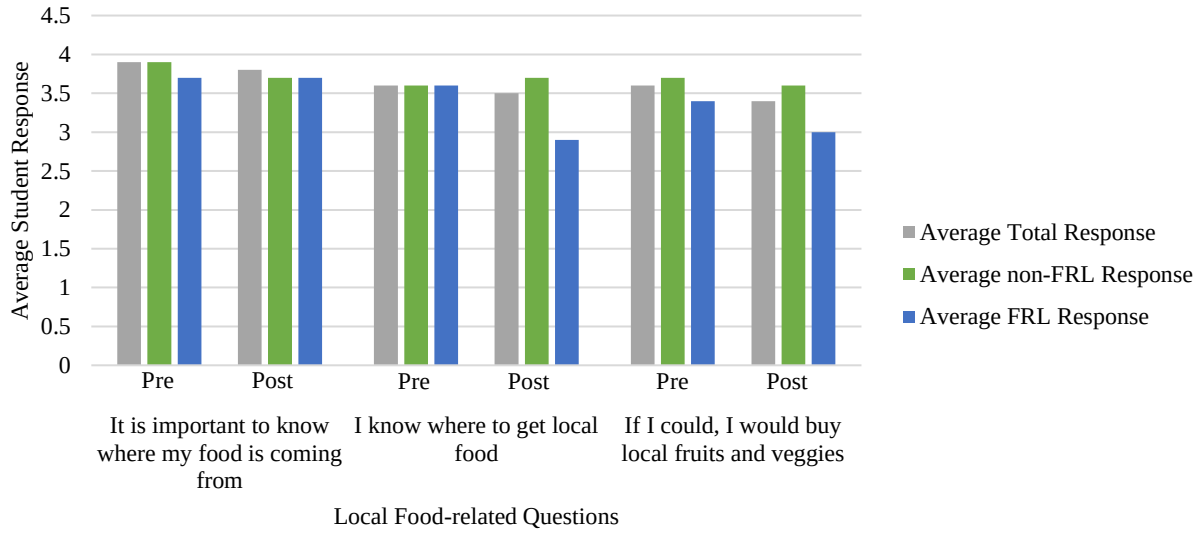

Figure 6. Comparison of Average Response from Pre- to Post-Survey for Local Food-related Questions

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don't know, don't care, 4 being agree and 5 being strongly agree.

Table 8. Comparison of the average student response from those who do not qualify for free or reduced lunch and those students that do qualify for the program before and after the garden program regarding gardening knowledge and interest

	Pre-Survey			Post-Survey		
	Average non-FRL Response	*Average FRL Response*	*Difference in response*	*Average non-FRL Response*	*Average FRL Response*	*Difference in response*
I feel that I could start my own garden with my family	3.2	3.4	+ 0.2	3.0	3.0	0.0
If I could, I would, grow my own food	3.2	4.7	+ 1.5	2.9	3.4	+ 0.5
Hands-on learning in the garden is fun	4.0	4.3	+ 0.3	3.3	2.7	- 0.6

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don't know, don't care, 4 being agree and 5 being strongly agree.

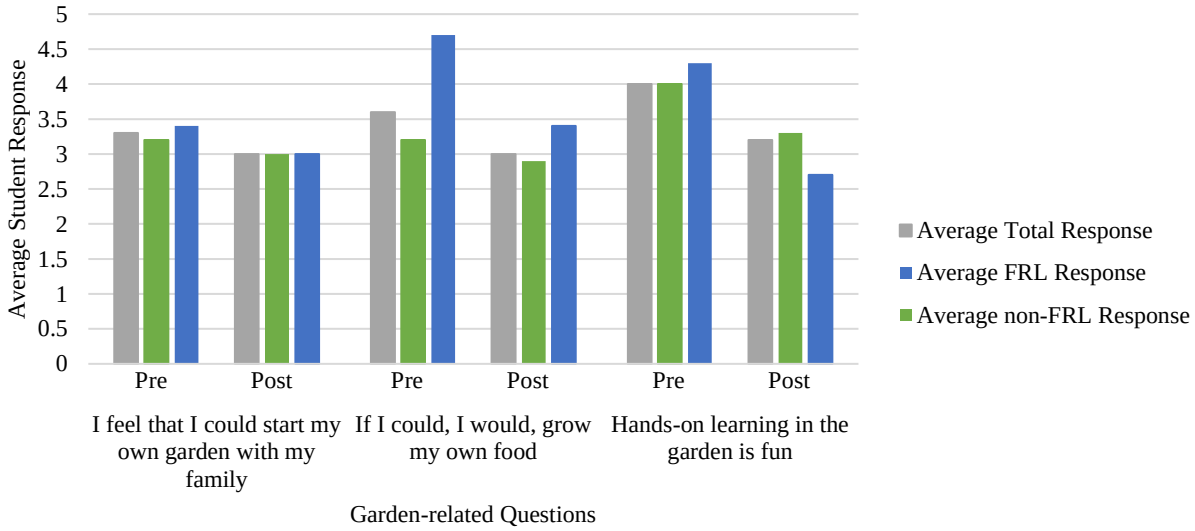

Figure 7. Comparison of Average Response from Pre- to Post-Survey for Garden-related Questions

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don't know, don't care, 4 being agree and 5 being strongly agree.

Table 9. Comparison of the average student response from those who do not qualify for free or reduced lunch and those students that do qualify for the program before and after the garden program regarding the student's power of their diet

	Pre-Survey			Post-Survey		
	Average non-FRL Response	*Average FRL Response*	*Difference in response*	*Average non-FRL Response*	*Average FRL Response*	*Difference in response*
I am happy with what I eat	4.0	3.7	- 0.3	3.9	3.0	- 0.9
I have the power to change what I eat	4.1	4.3	+ 0.2	4.0	3.6	- 0.4
I do not have a choice in what I eat	2.0	3.1	+ 1.1	1.9	2.0	+ 0.1

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don't know, don't care, 4 being agree and 5 being strongly agree.

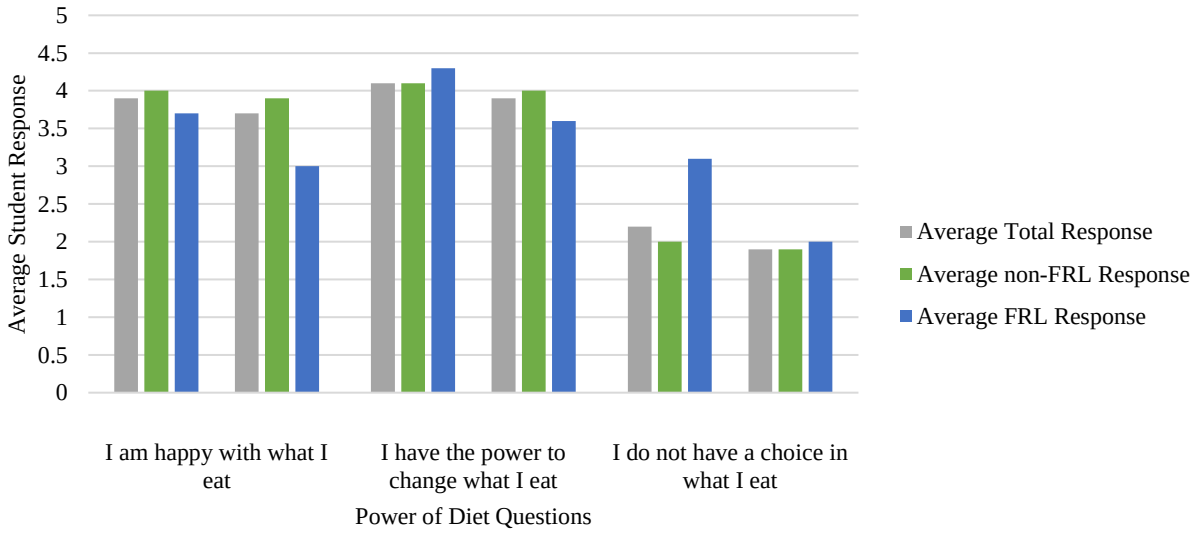

Figure 8. Comparison of Average Response from Pre- to Post-Survey for Students' Perceived Power over their Diet

Note: Statements were scored on a 0-5 scale; 0 being no answer, 1 being strongly disagree, 2 being disagree, 3 being don't know, don't care, 4 being agree and 5 being strongly agree.

DISCUSSION

The purpose of this study was to determine the effectiveness of the garden-based education initiative at Meadville Area Middle School. The results of this study indicate that minimal exposure (3 lessons in 9 weeks) was not enough to definitively determine if the program has the ability to influence and change behavior, attitudes, and knowledge in terms of nutrition, meal preparation, gardening/agriculture, and environmental stewardship. The preliminary results do indicate that further development of the program and of the evaluation process could lead to positive outcomes. There is the hope that this program will encourage students to seek out opportunities for continued learning on these topics and to continue to make healthy choices. Several factors (as outlined below), may have influenced the inclusive program evaluation. Time and more detailed analysis will tell if this program is truly effective in influencing healthy and sustainable behaviors, attitudes, and knowledge. Furthermore, review of the survey tool used in this project and the constraints of the research timeline suggest that the results shown here may not reflect the program outcomes in their entirety. Using observations taken while the students participated in the survey, as well as, the personal thoughts of the author during data analyzation, a revised version of the survey has been generated for future research.

Nutrition

Poor wellness and inadequate nutrition knowledge were both areas of concern that prompted the creation of this program. Providing middle school students with knowledge about healthy eating and about growing their own food is a vital component in helping them have a healthier adulthood (Ratcliffe et al 2011, Evans et al 2012. Morgan et al 2009). Like the results found in the 2014 survey, most students indicated that they feel healthy (Waggett & Garrett), but students also recognized that they want to eat more fruits and vegetables and less fast food. There is no way to determine whether this acknowledgment will lead to actual change, but the results do show that students are thinking about changing their dietary habits. Student change was observed in terms of the servings of fruits and vegetables consumed each day. Per USDA standards, boys and girls between the ages of 9 and 13, should be eating between 2 and 2.5 cups of vegetables each day and 1.5 cups of fruit (USDA, 2016). Most students indicated that they consume between 2-5 servings of a combination of fruits and vegetables. Depending on the exact ratio of fruit and vegetable servings, students could be considered to fall within the healthy consumption range. From pre- to post-program, 4 students moved from 0-1 servings to 2-5 servings. This behavior change could be a result of the program's mission to increase consumption of fruits and vegetables. MAMS students' fruit and vegetable consumption meet the standards of the USDA, but more recent research shows that the consumption levels should be increased. An article published in early 2017 recommends ten servings of fruits and vegetables per day. This study found that following this diet could result in the prevention of 7.8 million premature deaths per year (Aune et al 2017). By these standards, none of the 30 students surveyed are consuming enough fruits and vegetables. As more research is done on this front, the program will need to change accordingly and encourage the appropriate rate of fruits and vegetables. Preliminary results suggest that students have become more aware of the problems in their dietary habits, and have a desire to change them, but further surveying would be needed to prove if this program is effective in this objective.

Meal Preparation

Meal preparation was a major component of the lessons taught during the evaluation period. Overwhelmingly, students enjoyed the Harvest of the Month lesson in which they prepared Parmesan Roasted Carrots. As a healthy alternative to normal fries or chips, student exposure to this recipe will hopefully encourage students to make this snack or other healthy alternatives at

home with their families. Exposure to healthy meal preparation is very important for students. Meal preparation in the classroom and at home has been linked to higher fruit and vegetable consumption and with lower fat, fried food, and sugar-sweetened beverage consumption (Chu et al 2013). When students can grow, cook, and eat their own produce, especially in a social setting such as with a class, they are more likely to eat healthy foods that normally they would not have tried (Ozer 2007, Wansink, Hanka & Just 2015). Many health issues that are plaguing people nationwide, and in Crawford County, are due to poor diets, but by encouraging young students to prepare healthy meals together, their family's diet quality will be improved and, consequently, general wellness will also improve.

Gardening and Agriculture

As a garden-based education initiative, the garden should have served as the major focus of the program, but due to inclement weather and scheduling conflicts, students were unable to go outside. This factor could explain why students' knowledge, interest, and confidence in their ability to garden largely remained the same or decreased. There is also the possibility that these numbers decreased because students realized that gardening is difficult and requires a lot of knowledge, time, resources, and patience. Encouragingly, general student interest in learning about gardening remained high and increased after the program. This data shows that students are still very much interested in learning about gardening if given the right opportunity. Opportunities that allow the students to get outside should be capitalized on since garden programs have been proven to be the most effective when students can physically work in the soil and harvest the results of their hard work (Evans et al 2012, Morgan et al 2010). In a study comparing students who were exposed to one or more garden program components to students who were not exposed to any components, students who were exposed scored higher on the post-survey for their preference for healthy foods, self-efficacy, motivation, knowledge and consumption of fruits and vegetables per day and lower in their preference for unhealthy foods (Evans et al 2012). Since much of the school year takes place during colder months, it might be advantageous to incorporate alternative agriculture systems, such as aquaponics or container gardens, into lesson plans and future projects so that students can have the hands-on learning experience without leaving the building. The AgriScience Education Project at the University of Arkansas has successfully implemented

aquaponics systems in schools that have been shown to engage students in many different disciplines and that promote interest in agriculture without leaving the classroom (Wardlow 2002).

Environmental Stewardship

During the survey period, the topic of environmental stewardship was not emphasized as much as the other main topics, and consequently, the results reflect this fact. The results showed that students lacked the knowledge and the ability to connect concepts in this area, though it will take more surveying to truly understand student perceptions of this topic. While most students do feel responsible for protecting the environment, they were unable to define what environmental stewardship meant to them or to correctly understand that agriculture can have a negative effect on the environment. It is possible that the phrasing of the question was not clear. The phrase "environmental stewardship" was chosen because it mimicked the language used on the EPA grant proposal, but it could have confused students because it is not as commonly used as phrases such as "environmental protection," "environmental conservation," or "environmental sustainability."

There are many possibilities for the lack of interest and knowledge in this area. Many studies point to the lack of appreciation and connection with nature as a major factor to this trend; conversely, the more time children spend outside, the more interest and concern that children have for the natural world (DiClaudio, Hughes & Savoca 2013, Skelly & Zajicek 1998, Skelly and Bradley 2007, Louv 2011). Since the class was not able to go outside during any of the lessons, and since it is likely that many of these students do not spend significant time outside on their own, it can be hypothesized that students simply do not have enough personal connection to care about its protection. An increased effort should be made to get students outside during the program and/or to encourage it outside of school so that they can gain more interest and investment on this topic. It is also possible that the general lack of interest in this topic stems from the fact that while students are taught that protecting the environment is their responsibility, they do not understand the complexities of the issues. Today's children have been taught that they should recycle, to turn off the water while they brush their teeth, and even to avoid certain products from the time they were born, but this does not necessarily lead to being environmentally conscious. A forty-year study found that today's youth are less interested in the environment and in conserving resources despite growing up amidst the hot topic of climate change (The Associated Press 2012). The reasons for

this shift in attitude is unclear, but if students can be engaged in and learn to appreciate the natural world from a young age, a trend of environmentally conscious young people could be created.

Free or Reduced Lunch

Meadville's socioeconomic status was one of the driving forces for the creation of the Community Wellness Initiative and the implementation of this program. With 50% of Crawford Country School District students eligible for free or reduced lunch, it is invaluable to compare how this program affected the students that need the program most (Pennsylvania Partnerships for Children 2016, Allegheny College 2013). The priorities for the program should be determined by the most vulnerable group which is, in this case, those that qualify for a federal assistance program such as free or reduced lunch. The analyzation of the data shows an interesting trend, the data shows that FRL students are aware that they should change or improve a specific aspect of their lives such as their diet, but the data does not support students' ability to actually take action on that awareness. This is most likely because the students face a financial constraint that does not allow them to change. As compared to non-FRL students, FRL students indicated that they did not feel they knew where to get local food, nor are they interested in purchasing it. Fresh local food is often perceived as more expensive and time-consuming to cook than processed pre-prepared foods because it can cost more upfront, can go bad more quickly, require additional supplies (spices, oil, pots/pans, reliable appliances etc.), require time and cooking skills and are often not covered by federal assistance programs (Local Food Connection 2008). To combat the issue of not knowing where to purchase local food, growing one's own produce would solve the issue. Gardening provides one with the ability to create their own food security. Student responses showed an interest in this activity, but that they did not feel as if they had the skills to do so. If the development of gardening skills became a more central focus of the program, healthier diets and more food security could be observed in years to come.

Program Goals and Objectives

There are definite areas where the program could more directly meet the goals and objectives set out in the EPA grant proposal. As stated in the proposal, the garden should serve as a focus of the program to teach about local food systems and sustainability and to learn gardening skills. Students were unable to achieve this last goal in the time span of the period surveyed. The grant proposal

also stated that lessons should meet Pennsylvania Academic Standards, but since Family and Consumer Science no longer has standards, that component of the grant was irrelevant. The grant put much more emphasis on teaching about environmental issues and on encouraging environmental stewardship than this program could effectively cover. The program was effective in educating and engaging students on the topic of nutrition and students responded well to these lessons. Since weather and scheduling conflicts limited students' experiences, only time and more surveying will be able to tell if this program is truly effective in influencing students' behavior, knowledge, and attitudes. Results from this survey are tentative and should not be interpreted as conclusive.

Limitations

A few limitations may have hindered a true and comprehensive evaluation of the wellness program and of student responses. Only students in the second quarter were evaluated, and of those 97 students, only 30 completed both the pre- and post-survey. Surveying only 31% of the possible sample severely limits the range of data collected. In addition, student experience during the second quarter was restricted because the students were only able to work with the program coordinator three times during the nine-week academic quarter and the students were not able to go outside to the garden during any of those lessons due to inclement weather and scheduling issues. After so few lessons and such a short time table, it is hard to truly determine the change in students' behavior, attitudes, and knowledge. While this program has full support from the Meadville Area Middle School administration and teachers, working within a public-school system poses many challenges such as changes in schedules, school policies, and state education requirements, that hinder the ease of effectively implementing this program. Finally, the format and content of the surveys posed problems for students taking them and for analysis. Many students found the format of the surveys confusing, and therefore, did not fill out the survey as was intended. The main issues that were observed were difficulty filling out the identification code, confusion over the directions to rank each statement using the Likert-scale and that students took too long to fill out the survey.

Future Recommendations

This study allowed for preliminary data to be collected on the garden program, as well as the opportunity to test the effectiveness of the survey. Using the revised version of the survey, students should be surveyed before and after the garden program each semester, year after year. Regular data collection will offer the chance for more in-depth and accurate measurement of student change as the program develops and expands. In the future, it would be valuable to gather the opinions from parents and teachers as to their thoughts on the effectiveness of the program. Children learn so much from their parents, so it would be invaluable to the success of this program, and the health of these students and the planet, if there was more outreach with parents. If parents see value in the program, they can help to reinforce healthy choices and environmental stewardship at home. This study only touches on a few main parts of the survey, but a more in-depth analysis and comparison of the data could be performed in the future depending on the needs of the evaluation. As the program expands, it might prove necessary to digitize the survey for ease of access for students and for easier data entry and analysis for the researcher.

CONCLUSION

Survey Revision

Although it was not the original purpose of this project, it became evident during the survey administration and analysis that the format of the survey would need to be revised (Appendix G and H). Despite spending much time and effort to make the survey as user-friendly as possible, the format proved to be difficult for the students to fill out. While students were filling out the survey it was observed that students took much longer than was expected. The survey will be shortened by removing some of the options for the Likert-scale section (1-3, instead of 1-5) and having the students circle their response instead of writing it. This will also standardize the responses and reduce the number of students filling out the survey incorrectly. The identification component of the survey will also be revised. Students will be asked for each component of the code separately, in order to minimize confusion. Ultimately, it might be determined that an identification code is unnecessary all together as the number of students participating continues to rise and the survey will need to be revised accordingly. In the future, the aggregate data might

be enough to form conclusive results. The revised versions of the surveys will be able to be used during the coming years to collect data that will, hopefully, represent a change in students' behavior, attitude, and knowledge. The information can be used to further evaluate the program, to assess change over time and to apply for more grants to expand the program in the future.

Implications for Meadville Community

This program, still in its early years, has the potential to greatly impact the lives of Meadville youth. While the results may not have shown a huge difference before and after being exposed to the program, the students are still being given the opportunity to learn about topics that otherwise might not have been covered as part of their public-school education. This program offers students an introduction to healthy foods, local food systems, and environmental stewardship, with the hope that it sparks a desire to be healthier and to continue learning about gardening, agriculture, and the environment. For students who have enjoyed the lessons and want to explore the garden more, they can participate in a summer program held at the MARC garden. Without this initial exposure to working with Taylor Hinton, students might be less interested in attending this summer opportunity. This camp offers the chance to learn and gain skills without the constraints of the school day schedule and winter weather. As the program becomes more established and refined, it can be hypothesized that students' behaviors, attitudes, and knowledge will grow and the Meadville community will reap the benefits of its success.

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APPENDIX A

Allegheny College Research Project Proposal
Crawford Central School District Board Meeting - November 14, 2016

Cultivating Food, Expanding Minds:
An Evaluation of Meadville's Garden-Based Education Initiatives
Submitted by Darby Anderson, Allegheny College Senior

Research Purpose: This study proposes to assess the impacts of garden-based education on the attitudes, behavior and knowledge of 7th and 8th grade students at the Meadville Area Middle School (MAMS). As part of a community wellness grant that was awarded to the Meadville community, the garden at the Meadville Area Recreation Complex (MARC) was built to provide students with experiential learning opportunities in the garden. This proposed research will evaluate the effectiveness of some garden-based curriculum at MAMS and is part of the assessment requirements of the granting foundation.

Participants & Curriculum: Participants will include students enrolled in the Family and Consumer Science class during the second quarter, November 4, 2016 – January 20, 2017. As part of the class, Wellness Programs Coordinator Taylor Hinton will facilitate a series of garden-based lessons during the roughly 10-week period. This is the second year in which the program will be offered and all program components are coordinated with the host teacher to meet regular class requirements. Students will go out into the garden, cook together, and discuss topics on food and nutrition. The purpose of these lessons is to empower students to make healthy decisions in regards to food purchasing, proper nutrition, and land stewardship, as well as providing hands-on experience gardening and preparing food.

Assessment Methods: I am seeking permission to administer an assessment survey before and after the students' participation in the class. The survey will be administered at the beginning of the quarter to establish a baseline and then again at the conclusion of the quarter; it will take students approximately 10 minutes to complete. Questions asked (see attachment) will focus on students' general opinion of the class; knowledge gained about nutrition, agriculture/gardening and stewardship; behavioral changes with regards to purchasing, cooking and eating habits and their sense of responsibility to eat more healthy foods and towards the environment.

Research Protocols: The assessment survey is non-invasive, with no risks posed to participants because personally identifying information is not required to participate. Students will be provided a parental consent form with information about the study that must be returned before the survey is administered. Additionally, students will be asked to sign a student assent form and will have the option not to assent or to stop taking the survey at any point. The survey will only be administered to those students that submit both parental consent and student assent forms. The survey instrument has been reviewed by the Allegheny College Institutional Review Board, which is charged with reviewing and approving human participant research protocols. This project complies with Department of Health and Human Services (HHS) requirements, specifically the Code of Federal Regulations (CFR), Title 45, Part 46, and is conducted in accordance with the principles outlined in the Belmont Report.

Assessment Results: Results will be made available to administrators, teachers, and parents and will be shared with the original granting organization. The data collected will be summarized in my senior comprehensive project report and may be used to apply for future grants to improve and expand the garden-based learning program.
Questions or concerns may be directed to:
-Darby Anderson (Research Coordinator) 717-713-9620, andersond@allegheny.edu
-Dr. Benjamin Haywood (Faculty Advisor) 814-332-5347, bhaywood@allegheny.edu
-Taylor Hinton (Wellness Programs Coordinator) 440-532-1075, thinton@allegheny.edu

APPENDIX B

11.16.2016

Dear Institutional Review Board,

The purpose of this letter is inform you that we give Darby Anderson permission to conduct her study, "Cultivating Food, Expanding Minds" with students in the Family and Consumer Sciences class at the Meadville Area Middle School (MAMS). As a participant in the Allegheny Community Wellness Initiative garden-based education program, we understand that this research is designed to evaluate the outcomes of this program. We also understand that the study involves a pre- and post-project survey and that students and their parents will have to opt in to the study.

This also serves as assurance that this school complies with requirements of the Family Educational Rights and Privacy Act (FERPA) and the Protection of Pupil Rights Amendment (PPRA) (see back for specific requirements) and will ensure that these requirements are followed in the conduct of this research.

Sincerely,

Scott Lynch, MAMS Principal, _____

Sarah McKissick, MAMS Family and Consumer Science Teacher, _____

Taylor Hinton, Wellness Programs Coordinator, _____

Relevant FERPA and PPRA Guidance

- The right of a parent of a student to inspect, upon the request of the parent, a survey created by a third party before the survey is administered or distributed by a school to a student. Any applicable procedures for granting a request by a parent for reasonable access to such survey within a reasonable period of time after the request is received.
- Arrangements to protect student privacy that are provided by the agency in the event of the administration or distribution of a survey to a student containing one or more of the following items (including the right of a parent of a student to inspect, upon the request of the parent, any survey containing one or more of such items): Political affiliations or beliefs of the student or the student's parent. Mental or psychological problems of the student or the student's family. Sex behavior or attitudes. Illegal, anti-social, self-incriminating, or demeaning behavior. Critical appraisals of other individuals with whom respondents have close family relationships. Legally recognized privileged or analogous relationships, such as those of lawyers, physicians, and ministers. Religious practices, affiliations, or beliefs of the student or the student's parent. Income (other than that required by law to determine eligibility for participation in a program or for receiving financial assistance under such program).
- The right of a parent of a student to inspect, upon the request of the parent, any instructional material used as part of the educational curriculum for the student. Any applicable procedures for granting a request by a parent for reasonable access to instructional material received.
- The administration of physical examinations or screenings that the school or agency may administer to a student.
- The collection, disclosure, or use of personal information collected from students for the purpose of marketing or for selling that information (or otherwise providing that information to others for that purpose), including arrangements to protect student privacy that are provided by the agency in the event of such collection, disclosure, or use.
- The right of a parent of a student to inspect, upon the request of the parent, any instrument used in the collection of personal information before the instrument is administered or distributed to a student. Any applicable procedures for granting a request by a parent for reasonable access to such instrument within a reasonable period of time after the request is received.

APPENDIX C

MAMS Community Garden Evaluation - Parental Consent Form

Dear Parent or Guardian:

My name is Darby Anderson and I am a senior at Allegheny College. I am asking your permission for your child to complete a survey being administered to students at school. Your child has been selected because s/he is enrolled in the Family and Consumer Science class during the second quarter. The survey will ask questions about the Community Garden at the Meadville Area Recreation Center. It will be a two-part survey, the first part will be administered at the beginning of the second quarter in November and the second part will be administered at the end of the second quarter in January, 2017. It is our hope that data from this survey will contribute to a better understanding of the effectiveness of the garden and how it can better serve the community from an education standpoint.

Your child's responses to the survey will be confidential. Your child's name will not be recorded; there will be no way to connect your child's name to the responses that s/he provides on the survey, and no identifying information will be included in final published reports. However, summary data from this research project may be used in publications/presentations. The collected data will be analyzed and compiled and the conclusions drawn will be made available to you at the conclusion of the project.

Your consent and your child's participation are completely voluntary and your child may withdraw at any time. There is no reward for participating or consequence for not participating. There are no significant risks associated with participation in the study. We will also seek your child's permission to participate before s/he begins the study.

For further information on this research please contact:

- Darby Anderson, student researcher, at andersond@allegheny.edu or 717-713-9620
- Dr. Benjamin Haywood, Faculty Advisor, at bhaywood@allegheny.edu or 814-332-5347
- Taylor Hinton, Wellness Programs Coordinator, at thinton@allegheny.edu or 440-532-1075
- Dr. Allison Connell Pensky, Allegheny's IRB Chair, at aconnell@allegheny.edu or 814-332-2706.

Please return the bottom half of this sheet to school by ……

MAMS Community Garden Research Project

By signing below, I agree to allow _____to participate in this study.

Print Child's Name

Signature: _____

Name (please print): _____

Date: _____

APPENDIX D

Community Garden Evaluation - Student Assent Form

By signing below you are providing your assent to willingly participate in the research project about the MAMS Community Garden and agreeing that you understand that the researchers from Allegheny College are hoping to determine the effectiveness of the classes taught in the garden.

I understand that I will be taking a brief survey at two points during the term (beginning and end of the quarter). I will be asked about gardening, nutrition and the environment. The surveys will take place at Meadville Area Middle School and should take about 15 minutes of my time.

I am taking part because I want to. I have been told that I can stop at any time, and if I do not like a question, I do not have to answer it. No one will know my answers. I understand that my answers will be used to create a summary report that will be given out to teachers, parents and administrators but that my individual identity will not be included in this material.

Name_____

Signature_____

Date: _____

APPENDIX E

Community Garden Evaluation - Student Pre-Survey

Identification #: (first initial, birthdate (mm/dd/yyyy), # of siblings)_____

Have you worked with Miss Taylor in the garden before this class? Yes or No

What are you most interested in learning in the garden this quarter?

How much do you agree or disagree with the following statements?
1 – Strongly Disagree, 2 – Disagree, 3 – Don't Know, Don't Care, 4 – Agree, 5 – Strongly Agree

If I could, I would…
Eat more fruits and vegetables
Eat more freshly prepared meals
Eat less fast-food
Cook my own food more often
Grow my own food
Buy more local fruits and vegetables
Spend more time with friends/classmates cooking our own food

Right now…
I am happy with what I eat
I eat enough nutritious food
I feel healthy
I have the power to change what I eat
I do not have a choice in what I eat
I feel that I could start my own garden with my family
I know where to get local food

I think…
I am responsible for protecting the environment in any way I can
Hands-on learning in the garden is fun
Eating healthy is important
It is important to know where my food is coming from
That the way food is grown can negatively impact the environment

I am interested in learning about…
Agriculture
Nutrition
Stewardship
Gardening

On average, how many servings of fruits and vegetables do you eat per day? (1 fruit equals a serving of fruits and a ½ cup of vegetables equals a serving of vegetables)

0 – 1 servings
2 – 5 servings
6 – 9 servings
10 or more servings

In a normal week, how often does your family prepare meals together?

Everyday
At least 6 days per week
4-5 days per week
2-3 days per week
1 or less days per week

Does your family buy organic food on a regular basis if it is available? Yes or No

Define what environmental stewardship means to you:

Personal Information

What grade are you in?

7th
8th

Do you receive a free and reduced lunch?

Yes
No
Prefer not to answer

APPENDIX F

Community Garden Evaluation - Student Post-Survey

Identification #: (first initial, birthdate (mm/dd/yyyy), # of siblings)_____

What was your favorite lesson taught by Miss Taylor this term?

Did you learn everything that you wanted to in the garden program?

How much do you agree or disagree with the following statements?
1 – Strongly Disagree, 2 – Disagree, 3 – Don't Know, Don't Care, 4 – Agree, 5 – Strongly Agree

I enjoyed…
Learning about gardening and agriculture
Spending time outside in the garden
Preparing food with my classmates

If I could, I would…
Eat more fruits and vegetables
Eat more freshly prepared meals
Eat less fast-food
Cook my own food more often
Grow my own food
Buy more local fruits and vegetables
Spend more time with friends/classmates cooking our own food

Right now…
I am happy with what I eat
I eat enough nutritious food
I feel healthy
I have the power to change what I eat
I do not have a choice in what I eat
I feel that I could start my own garden with my family
I know where to get local food

I think…
I am responsible for protecting the environment in any way I can
Hands-on learning in the garden is fun
Eating healthy is important
It is important to know where my food is coming from
That the way food is grown can negatively impact the environment

I am interested in learning more about…
Agriculture
Nutrition
Stewardship
Gardening

On average, how many servings of fruits and vegetables do you eat per day? (1 fruit equals a serving of fruits and a ½ cup of vegetables equals a serving of vegetables)

0 – 1 servings
2 – 5 servings
6 – 9 servings
10 or more servings

In a normal week, how often does your family prepare meals together?

Everyday
At least 6 days per week
4-5 days per week
2-3 days per week
1 or less days per week

Does your family buy organic food on a regular basis if it is available? Yes or No

Define what environmental stewardship means to you:

APPENDIX G

Revised Community Garden Evaluation - Student Pre-Survey

Identification #: first initial_____ birthdate (mm/dd/yyyy)_____# of siblings_____

Have you worked with Miss Taylor in the garden before this class? Yes or No

What are you most interested in learning in the garden this quarter?

How much do you agree or disagree with the following statements?
Circle the number the corresponding number with each statement: 1 – Disagree, 2 – Maybe, 3 –Agree

If I could, I would…			
Eat more fruits and vegetables	1	2	3
Eat more freshly prepared meals	1	2	3
Eat less fast-food	1	2	3
Cook my own food more often	1	2	3
Grow my own food	1	2	3
Buy more local fruits and vegetables	1	2	3
Spend more time with friends/classmates cooking our own food	1	2	3

Right now…			
I am happy with what I eat	1	2	3
I eat enough nutritious food	1	2	3
I feel healthy	1	2	3
I have the power to change what I eat	1	2	3
I do not have a choice in what I eat	1	2	3
I feel that I could start my own garden with my family	1	2	3
I know where to get local food	1	2	3

I think…			
I am responsible for protecting the environment in any way I can	1	2	3
Hands-on learning in the garden is fun	1	2	3
Eating healthy is important	1	2	3
It is important to know where my food is coming from	1	2	3
That the way food is grown can negatively impact the environment	1	2	3

I am interested in learning about…			
Agriculture	1	2	3
Nutrition	1	2	3
Environmental Conservation	1	2	3
Gardening	1	2	3

On average, how many servings of fruits and vegetables do you eat per day? (1 fruit equals a serving of fruit and a ½ cup of vegetables equals a serving of vegetables)

0 – 4 servings
At least 5 servings
6 – 9 servings
10 or more servings

In a normal week, how often does your family prepare meals together?

Everyday
At least 6 days per week
4-5 days per week
2-3 days per week
1 or less days per week

Does your family buy organic food on a regular basis if it is available? Yes or No

Define what environmental conservation mean to you:

Personal Information

What grade are you in?

7th
8th

Do you receive a free and reduced lunch?

Yes
No
Prefer not to answer

APPENDIX H

Community Garden Evaluation - Student Post-Survey

Identification #: first initial_____ birthdate (mm/dd/yyyy)_____# of siblings_____

What was your favorite lesson taught by Miss Taylor this quarter?

Is there anything that you would have liked to do as part of the program and/or any topics that you would have liked to learn more about?

How much do you agree or disagree with the following statements?
Circle the number the corresponding number with each statement: 1 – Disagree, 2 – Maybe, 3 –Agree

I enjoyed…			
Learning about gardening and agriculture	1	2	3
Spending time outside in the garden	1	2	3
Preparing food with my classmates	1	2	3
If I could, I would…			
Eat more fruits and vegetables	1	2	3
Eat more freshly prepared meals	1	2	3
Eat less fast-food	1	2	3
Cook my own food more often	1	2	3
Grow my own food	1	2	3
Buy more local fruits and vegetables	1	2	3
Spend more time with friends/classmates cooking our own food	1	2	3
Right now…			
I am happy with what I eat	1	2	3
I eat enough nutritious food	1	2	3
I feel healthy	1	2	3
I have the power to change what I eat	1	2	3
I do not have a choice in what I eat	1	2	3
I feel that I could start my own garden with my family	1	2	3
I know where to get local food	1	2	3
I think…			
I am responsible for protecting the environment in any way I can	1	2	3
Hands-on learning in the garden is fun	1	2	3
Eating healthy is important	1	2	3
It is important to know where my food is coming from	1	2	3
That the way food is grown can negatively impact the environment	1	2	3

I am interested in learning about…

Agriculture	1	2	3
Nutrition	1	2	3
Environmental Conservation	1	2	3
Gardening	1	2	3

On average, how many servings of fruits and vegetables do you eat per day? (1 fruit equals a serving of fruits and a ½ cup of vegetables equals a serving of vegetables)

0 – 4 servings
At least 5 servings
6 – 9 servings
10 or more servings

In a normal week, how often does your family prepare meals together?

Everyday
At least 6 days per week
4-5 days per week
2-3 days per week
1 or less days per week

Does your family buy organic food on a regular basis if it is available? Yes or No

Define what environmental conservation means to you: