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Effect of an After-School Garden Club Program on Elementary Students

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Abstract

The purpose of this study was to determine if three elementary school garden club programs influenced students' attitudes and behaviors regarding fruit and vegetable consumption. Both quantitative and qualitative data collection and analysis took place, in the form of pretest and posttest questionnaires as well as participant interviews. Overall, non-significant results were found in the quantitative portion of the study, which led the researcher to determine that the garden club program had no significant effect on the participants regarding perceptions of fruit and vegetable consumption. The overall non-significant differences found before and after the garden club intervention programs could lead researchers to further analyze effective factors of garden-based education. After qualitative analysis of participant interviews, the researcher determined that there were mostly non-significant changes in healthy eating after participating in the garden club, but that the overall experience for participants was positive in many aspects such as showing respect for nature, knowledge of how food affects the body, and that the activities were enjoyable. Researchers, educators, curriculum developers, and other professionals may be able to draw upon findings from this study to develop garden-based education to become an effective mode of food and nutritional content delivery.

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Chapter 1: Introduction

Statement of the Problem

School gardens can provide effective learning environments and offer opportunities for many different aspects of student learning (Hemenway, 1903; Herron, Magomo, & Gossard, 2007; Hill, 2012; O'Brien & Shoemaker, 2006; Rye et al., 2012). Through gardening, students can learn about food origins, practice physical activity, and increase fruit and vegetable consumption (Graham & Zidenberg-Cherr, 2005). Apple Seeds, Inc. has established a partnership with local elementary schools in Northwest Arkansas (NWA) to promote school gardens and healthy behaviors in children. The goal behind this collaboration is the pursuit of combating childhood obesity. An evaluation of the after-school elementary school garden club programs could provide information for possible future school gardens and healthy student initiatives across the region. Establishing effectiveness of the program may provide opportunities for additional funding which could lead to more students learning how to maintain healthier lifestyles and becoming involved in gardening and healthy living activities.

The obesity epidemic has become a national threat to our country's health, in both adults and children. Even though the overweight and obesity epidemic has begun to level off in the past year or so, approximately 17% of children and adolescents age two to 19 are still obese (Centers for Disease Control and Prevention, 2014). Obesity can lead to a variety of serious medical conditions and have other largely negative effects on health and lifestyle (Daniels, 2006; Waters et al., 2011).

One factor that may influence the likelihood of being overweight is fruit and vegetable consumption (Epstein et al., 2001; Ledoux, Hingle, & Baranowski, 2010). Research (Science

Daily, 2009) indicates that children today do not consume adequate amounts of fruits and vegetables. According to the "key consumer message" in the My Plate Strategic Partner Outreach Report (2012) children, as well as adults, should "make half [their] plate fruit and vegetables" (p. 1). The National Dietary Guidelines for Americans 2010 state that children two to 18 years of age need from one to two cups of fruit and one to three cups of vegetables daily, depending on age and gender (Food Groups, 2012).

Children today tend to be far removed from nature and various agricultural processes and have limited understanding of where food comes from (BBC News, 2010; Bucklin-Sporer & Pringle, 2010). When people understand where their food comes from they are able to better investigate food options and include more fresh food in their diets (Hughes, 2003). Bringing children "back to basics" in understanding food sources is important (Blair, 2009; Johnson, 2008) and may help them recognize dietary needs and make better choices on a daily basis. Children could be taught to make more informed and healthier decisions about what they eat, as increased knowledge about food can greatly impact food consumption (Somerset, Ball, Flett, & Geissman, 2005).

Some solutions to the child nutrition and food awareness issue have emerged in the form of school gardens, field trips to farmer's markets, and other activities that encourage understanding of basic food sources and how to live healthfully. School gardens have the ability to increase children's intake of fruits and vegetables, food source understanding, and development of overall healthier lifestyles (Derks, 2008). Gardening activities for children not only promote healthy eating habits, but also incorporate physical activity (Graham & Zidenberg-Cherr, 2005). Children can experience exercise through digging, planting, harvesting, preparing, and other activities associated with gardening.

Through research on child nutrition, it has been determined that many variables can contribute to a child's overall health, including family history, environmental factors, education, socioeconomic status, and neighborhood characteristics (Anderson & Swafford, 2011; Saelens et al., 2012; Suddath, 2009). The creation of opportunities for learning about food, nutrition, and healthy lifestyle choices early in life will increase the chances of forming life-long habits and avoiding overweight and obesity in adulthood (Baskale, Bahar, Baser, & Ari, 2009; Sandeno, Wolf, Drake, & Reicks, 2000). Garden clubs across the nation have been teaching young people about the importance of fruit and vegetable consumption and many other health-related factors (Derks, 2008; Hughes, 2003; Little, Wimer, & Weiss, 2008; Morris & Zidenberg-Cherr, 2002; Robinson-O'Brien, Story, & Heim, 2009; Skinner & Chi, 2012).

Many aspects of proper nutrition could be included in what youth are being taught through gardening, including food preparation and preservation techniques that could build lifelong skills for them to carry into adulthood. Because of the growing child overweight and obesity epidemic in the United States, early childhood is the ideal time to incorporate food and nutrition education in public schools (Baskale et al., 2009; Lineberger & Zajicek, 2000). Apple Seeds, Inc. garden club programs attempt to teach elementary school children about nutrition and other concepts such as where food comes from, fresh food preparation, and food preservation through the use of school gardens. These lifelong knowledge sets and skills may prepare children for making healthful decisions into adulthood. Evaluation of the garden club programs may provide data on how effective the program is for elementary students regarding fruit and vegetable consumption and provide necessary nutritional information to students at a crucial time in their lives.

Background of the Study

> The school garden tends to develop the best traits in the children, and to create in them a love for the beautiful. It gives play to all their motor activities, and shows that results follow causes, and is one of the best methods of curing them of stealing. They begin to understand something of ownership and responsibility, and look more kindly at their neighbor's products, and, as they do not wish to lose their own, that for which they have worked, the value of the product of another is more forcibly demonstrated to them (Hemenway, 1903).

Gardens can help children build skills they will use for the rest of their lives (Blair, 2009; Gaylie, 2009; Hemenway, 1903). Even though gardening has been shown to benefit children of all ages, elementary school is a crucial time period for children to develop these skills, as early childhood is the stage in which children learn essential nutrition information and develop eating habits that will carry into adulthood (Baskale et al., 2009). Piaget's cognitive development theory proposes that people build knowledge and learn from experiences and build schema, even from birth (Piaget, 1964). Children could develop life skills, nutrition information, and food intelligence as they progress toward adulthood. Currently, school gardens address a wide variety of knowledge sets, skills, and experiences that could benefit elementary students in regard to nutrition, obesity prevention, and many life skills (Anderson & Swafford, 2011; Heim, Stang, & Ireland, 2009; Hermann et al., 2006; O'Brien & Shoemaker, 2006) that may positively impact the rest of their lives. While some schools currently have nutritional lunch programs and provide healthy snacks, these initiatives alone are not enough to strongly influence students' life choices long-term. Action can be taken to bring children back to the basics of food and nutrition and educate them on how to live and maintain a healthy and active lifestyle for life. "In many ways a school garden program fills the huge void left by the disappearance of home economics curricula from our schools" (Bucklin-Sporer & Pringle, 2010, p.15).

Even though some nutrition content is taught in public schools, it is mostly found within secondary-level family and consumer sciences education (FCSE) courses, formerly known as home economics. In the state of Arkansas, seven out of the 24 middle and secondary-level FCSE content areas involve food and or nutrition, including the courses Family and Consumer Sciences and Family and Consumer Sciences Investigation, as well as a course titled Food and Nutrition. None of these courses are taught at the elementary level, nor are they required for all secondary students. These FCSE courses are often offered as elective credits at the secondary level, so not all students in the state of Arkansas are receiving this content. Almost a third of FCSE course offerings are teaching students about healthy decision making and food preparation, but students are not consistently being taught these valuable skill sets at a young age. As outlined in the National Standards for FCSE (2008), one of the mission objectives is to "provide opportunities to develop the knowledge, skills, attitudes, and behaviors needed for…promoting optimal nutrition and wellness across the life span" (para. 5). Even though most would argue that elementary students are not preparing or choosing the food they eat, nutritional standards could still be incorporated into their lives for use later when they are the sole decision-makers about their own nutrition. In many schools across the country, elementary students can choose one of two or three lunch options, and even if they choose the least healthy option, students still have the ability to decide what to eat from their plates. Research (Ebster et al., 2009; Moller Jensen, 1995) also shows that children largely impact food purchases while grocery shopping with a parent.

Through school gardens, elementary students can learn some essential nutrition knowledge and skills that could positively impact the rest of their lives (Hemenway, 1903). School gardens have much to offer young students and could be an integral part of elementary

students' daily lives. This immersion of life skills and nutritional content in early childhood could eventually lead to other valuable life skills education included in the elementary curriculum. Not only do gardens have the ability to enhance nutrition knowledge, but they can also enhance learning in nearly every other discipline in school, including mathematics, science, business, and language (Hemenway, 1903). Giving students the opportunity to connect with nature through gardens may also provide the inspiration they need to become more thoughtful citizens about environmental issues (Bucklin-Sporer & Pringle, 2010).

School Gardens. School gardens have been in existence for a long time, but have evolved substantially over the years. In 1891, the first school garden in the United States was established at George Putnam School in Roxbury, Massachusetts by Henry Lincoln Clapp who had traveled to Europe to study gardening in schools (Desmond, Grieshop, & Subramaniam, 2002). In 1903, Hemenway wrote that there were more than 100,000 school gardens in Europe alone, and that schools would not receive state funds unless gardens were established in conjunction with them. Some school gardens were established to increase the salary of a teacher, while other schools developed botanical gardens that grew plants for students to study (Hemenway, 1903). According to Trelstad (1997) in the first two decades of the twentieth century, school gardens emerged for many reasons, including civic reform, education reform, planning, as well as in support of the early conservation movement. In the early 1900s, nature study emerged in education mostly to incorporate nature into the classroom to make learning more interactive (Trelstad, 1997). This initiative spurred the creation of many school gardens throughout the country. After that, the school garden movement flourished in three waves: 1900-1930s, 1960-1970, and 1990-2000 (Desmond, Grieshop, & Subramaniam, 2002, p. 16). The Progressive Era and social reform movements of the early twentieth century encouraged garden-

based learning, and then in the mid-1900s the Counter Culture and environmental movements resurrected the school and community garden concepts (Desmond, Grieshop, & Subramaniam 2002, p. 16). Then, in the last decade of the century, the rebirth of the Progressive Education movement along with the most recent concern with environmental education and child nutrition issues caused another resurgence of school gardens (Desmond, Grieshop, & Subramaniam 2002, p. 16).

Although some of the gardens in the early twentieth century were in the form of victory gardens to ensure that families had enough to eat in difficult financial times during the Great Depression and war-times, the need today is somewhat opposite. According to Bucklin-Sporer and Pringle (2010, p. 14), "society has a surfeit of calories, but a tremendous need for better nutrition."

Apple Seeds, Inc. Apple Seeds, Inc. is a non-profit organization based in Northwest Arkansas that, through many different initiatives, provides education and information to both children and adults that supports local food systems to improve nutrition within the region (Welcome to Apple Seeds, Inc., 2012, para. 1). In 2005, the *Apples in the Classroom* program was created by a local retail establishment, *Ozark Natural Foods*. This program eventually became Apple Seeds in 2007, and even during the initial stages of the program, the focus was on nutrition education. Nutrition instruction was created and provided to over 1,500 students according to the Arkansas educational requirements. The participating students were third and fourth graders in 65 different classrooms within the school districts of Fayetteville, Bentonville, and Elkins, AR. According to the Apple Seeds, Inc. website, "these lessons included information on different classifications of foods, healthy snacking options, portion control, the Food Guide Pyramid, and the effects of certain foods on our bodies" (Welcome to Apple Seeds,

Inc., 2012, para. 6). Addressing the overweight epidemic in NWA is the major goal of Apple Seeds, Inc. and is attained through providing students with education that encourages healthy eating behaviors at a young age. As stated on the Apple Seeds website, "our programs help to counter the pressures on young people to consume excess fats and other unhealthy foods" (Welcome to Apple Seeds, Inc., 2012, para. 3). Apple Seeds, Inc. specific program goals are "to help students and their families make nutritious food choices and form lifelong healthy eating habits and to foster a sustainable food system that emphasizes fresh food, good nutrition, stewardship of resources, and local economy" (Welcome to Apple Seeds, Inc., 2012, para. 4). Specifically, the Apple Seeds Inc., garden club mission is stated as:

> The goal of the gardening program is to teach gardening skills and nutrition in an engaging, hands-on environment that reinforces classroom learning and encourages students to make healthy life choices. The program will empower students with the skills to grow their own food, the knowledge to make healthy food choices, and also teach the value of gardening as exercise (School Gardening, 2012, para. 5).

Apple Seeds began the school garden club initiative in 2009 at one elementary school, and currently conducts after-school garden clubs at four schools within the Fayetteville school district. Program coordinators work with school personnel, parents, and students at each school to develop a school garden and program that will best suit the entire school community. Services provided by Apple Seeds include choosing garden sites, developing student involvement, obtaining tools and materials, establishing a garden maintenance plan, providing lesson plans, and establishing partnerships with local organizations to support the garden program. As a community-focused organization, Apple Seeds, Inc. expects to, through their work, "facilitate real behavioral changes in food choices and healthy activities in our community" (Welcome to Apple Seeds, Inc., 2012, para. 5).

Purpose of the Study

The purpose of this study was to determine if three elementary school garden club programs influenced students' attitudes and behaviors regarding fruit and vegetable consumption. Findings from this study may provide researchers, educators, curriculum developers, and other professionals with information about how to improve the program being evaluated, whether or not garden activities influence elementary students' perceptions of fruit and vegetable consumption, and participating students' attitudes regarding healthy eating behaviors. Information about these concepts may enhance the understanding of how to reach students with nutrition and health information who need it most. This, in turn, may provide insight into how to address the obesity problem facing the United States and the world. Literature shows that school gardens have the ability to improve the attitudes of young students about healthy eating and living, and this study may offer information for future educators on how to engage students in activities that could make a difference in increasing fruit and vegetable consumption in children. Eventually, this information may add to the literature to create a foundation for incorporating gardening and other outdoor activities into public school curriculum frameworks.

This study was designed to evaluate the effectiveness of three after-school elementary garden club programs and activities sponsored by Apple Seeds, Inc. and to provide further information on elementary students' attitudes and behavior associated with fruits and vegetable consumption. This may allow garden club leaders, teachers, and other school personnel to re-evaluate their teaching methods and approaches to introducing children to new and healthy foods. School garden initiatives can have a significant impact on student, family, and community health and can bring about change within schools to create a healthier more

community-oriented environment (Bucklin-Sporer & Pringle, 2010). Through analysis of participant pre-post questionnaires and participant interviews, the following research questions were addressed.

Research Questions

1. Do garden club activities impact students' perception of their own consumption of fruits and vegetables?
2. Do students' perceptions of healthy eating behaviors change after participating in garden club?

Significance of the Study

Findings from this study may add to the literature on school gardening and may help educators nationwide understand student perceptions of fruits and vegetables and provide implications on how to better teach children about healthy living. Gardening is a skill that may provide lifelong benefits to young children, and this study may also enhance our understanding of what impact school gardens could possibly have on elementary students. School gardening initiatives around the country and world may benefit from a more solid foundation of evidence that such programs and activities make a difference in the health of today's youth. This study may contribute to the movement of determining if school gardens across the nation are making a difference in K-12 schools by influencing attitudes about eating fruits and vegetables, healthy behaviors, and developing life-long skills. This study may add to the literature about programs designed to help with the problem of child obesity and could provide insight into how to improve this and other school garden programs.

Scope of the Study

This study analyzed elementary school garden club programs at three schools in Northwest Arkansas within one school district. Even though garden activities may serve as a learning avenue for students of all ages, this study specifically addressed elementary students. Data was collected during the spring of 2013 and was limited to the analysis of three elementary school garden club programs. Questionnaires were distributed to participating students before and after the garden club program. Semi-structured interviews took place at the end of the garden club program with a convenience sample of participating students.

Definition of Terms

1. Apple Seeds, Inc. is a non-profit organization located in Northwest Arkansas since 2005. Their primary goals are to improve community nutrition through educational services, including elementary school garden clubs.
2. Child obesity is having a BMI at or above the 95th percentile for other children of the same age and gender (Barlow, 2007).
3. Child overweight is having a BMI at or above the 85th percentile and lower than the 95th percentile for other children with the same age and gender (Barlow, 2007).
4. Family and consumer sciences (FCS) education "is the comprehensive body of skills, research, and knowledge that helps people make informed decisions about their well being, relationships, and resources to achieve optimal quality of life. The field represents many areas, including human development, personal and family finance, housing and interior design, food science, nutrition, and wellness, textiles and apparel, and consumer issues" (American Association of Family and Consumer Sciences, 2012, para. 1).
5. Food miles are number of miles food travels from its source to the consumer or end-user.

6. Fruit and Vegetable Neophobia is the reluctance to eat certain fruits and vegetables that are new or unfamiliar.
7. Garden clubs can be any organization of individuals who participate in garden-related activities.
8. Garden Based Learning (GBL) can be defined simply as an instructional strategy that utilizes a garden as a teaching tool (Desmond, Grieshop, & Subramaniam, 2002, p. 9).
9. Northwest Arkansas (NWA) is the northwest region of the state of Arkansas and is made up of Baxter, Boone, Benton, Carroll, Madison, Marion, Newton, Searcy, and Washington counties.
10. School gardens consist of any type of indoor or outdoor space where students can learn about various aspects of nature, including plants, insects, composting, and nutrition through food planting and harvesting.
11. Socioeconomic status is measured by an individual's levels of education, income, occupation, or a compilation of all three (Winkleby, Jatulis, Frank, & Fortmann, 1992).

Chapter 2: Review of the Literature

Purpose of the Study

The purpose of this study was to determine if three elementary school garden club programs influenced students' attitudes and behaviors regarding fruit and vegetable consumption. Literature shows that school gardens have the ability to improve the attitudes of young students about healthy eating and living, and this study may offer information for future educators on how to engage students in activities that could make a difference in increasing fruit and vegetable consumption. Eventually, this information may add to the literature to create a foundation for incorporating garden and other outdoor activities into public school curriculum frameworks. The study was designed to evaluate the effectiveness of three after-school elementary garden club programs and activities sponsored by Apple Seeds, Inc. and to provide further information on elementary students' perceptions of fruits and vegetable consumption.

Research Questions

1. Do garden club activities impact students' perception of their own consumption of fruits and vegetables?
2. Do students' perceptions of healthy eating behaviors change after participating in garden club?

Introduction

Child obesity has become a national threat to our country, with currently more than 16% of children and adolescents age 2-19 considered obese (Ogden & Carroll, 2010). With the United States having one of the highest rates of obesity in the world, organizations such as the International Association for the Study of Obesity (IASO), World Health Organization (WHO),

Centers for Disease Control and Prevention (CDC), and the National Center for Health Statistics (NCHS) provide ongoing research and information to the public to help address this issue. Arkansas tied for tenth place for the "fattest" states in America (U.S. News and World Report, n.d.) with Ohio, both with a 28.6% obesity rate (U.S. News and World Report, n.d.). In Arkansas public schools, 20.4% of students are overweight and 37.5% of children and adolescents face the risk of obesity (Arkansas Center for Health Improvement, 2006).

Overweight and obesity in children can have detrimental effects on quality of life, including an increased risk of developing several conditions, including hypertension, type 2 diabetes, hypercholesterolemia, coronary heart disease, stroke, asthma, and arthritis, (Hammond & Levine, 2010; Whitlock, Williams, Gold, Smith, & Shipman, 2005). Children who are overweight or obese have a higher risk of developing sleep apnea, impaired glucose tolerance, insulin resistance, fatty liver disease, and gallstones (Whitlock et al., 2005).

According to the *Health Consequences of Childhood Obesity,* overweight children and adolescents are not only at risk for serious health problems, but also often have a lower quality of life (Alliance for a Healthier Generation, 2012). Dietz (1997) claims that the "most widespread consequences of childhood obesity are psychosocial" (p. 518) and that obesity may either lead to psychosocial problems or that psychosocial issues in children and adolescents may increase the risk of becoming overweight or obese. A study by Griffiths, Wolke, Page, and Horwood (2006), showed that being overweight can significantly determine future bullying involvement, either as victims or as perpetrators.

Risk Factors

Poor nutrition. High levels of food neophobia can have a negative influence on children's eating behaviors and nutrition patterns. In a study by Cooke, Carnell, and Wardle

(2006), children who scored higher on the Child Food Neophobia Scale (CFNS) ate fewer fruits, vegetables, and proteins. Moreover, twenty-three publications were analyzed by Ledoux, Hingle, and Baranowski (2010) who found that most of the experimental and longitudinal studies reported "the expected inverse relationship between [fruit and vegetable] consumption and adiposity" (p. 5) or mixed results in adults. In children, two longitudinal studies also found the inverse relationship or mixed results among elementary-age children. After a meta-analysis of current research, the Thompson School District Plate Waste Study (2011) reported that out of almost 1,300 elementary, middle, and high school students, only 56% of elementary students and 40% of secondary students chose fresh fruit to eat with their lunch and less than half of all the students chose vegetables. However, in a study by Gosliner, Madsen, Woodward-Lopez, and Crawford (2011), seventh and ninth grade students reported that healthy foods were either important or very important to have available for purchase at school. These studies suggest that even though children report wanting more healthy food, they may not actually choose it over alternative less healthy choices if presented with both.

Environment. Rasmussen et al. (2006) found that the main determinants of fruit and vegetable consumption among children age 6-12 were age, gender, socio-economic factors, preferences, parental intake, and home availability/accessibility. In a study of over 2,000 students in third, sixth, and seventh grades, Mellor, Dolan, and Rapoport (2011), found that proximity to fast-food restaurants was also significantly related to BMI. Children develop most of their eating preferences from exposure and repeated experience, and are responsive to parents' attempts to influence food habits (Lindsay, Sussner, Kim, & Gortmaker, 2006). Yu (2011) found that parental communication with children during TV watching significantly influenced children's attitude toward TV snack/fast-food advertising. One common argument from parents

is that eating healthy is more expensive and that they cannot afford to feed their families fresh fruits and vegetables. Accordingly, cost, convenience, and culture are all factors inhibiting the reduction of the overweight and obesity epidemic in the U.S. (Katz, 2009). The obesity problem might seem like a never-ending negative cycle, as peer acceptance and pressure also often determined by how children and adolescents behave. Bissonnette and Contento (2001) suggest that students' peers can strongly influence their eating behaviors and food preferences as well.

Lack of food source awareness. The average American home-prepared meal contains food items from at least five other countries (Natural Resources Defense Council, 2007). Studies have shown that many children today cannot identify the original source of common daily food items. Children today are far removed from nature and various agricultural processes and have limited understanding of what where food comes from (BBC News, 2010; Bucklin-Sporer & Pringle, 2010). "As the United States has become increasingly urbanized and surburbanized, people have, understandably, become more disconnected from the distant land and people that stock their supermarkets" (Schnell, 2007, p. 550). Much public concern is focused around the "increasing industrialization of the modern food system and the social distancing this creates between food production and consumption" (Bagdonis, Hinrichs, & Schafft, 2009, p. 108).

Proposed solutions

Numerous solutions have been proposed to alleviate the growing overweight and obesity problem facing today's youth. However, none have seemed to drastically make a difference in the nation as a whole. Steps have been taken in the form of legislation, school policies, food choice availability, awareness programs, and more. Shroff, Jones, Frongillo, and Howlett (2012) found that numerous different types of policy instruments have been used by U.S. states to control the competitive foods sold in schools and to help the school nutrition environment.

Additional efforts to increase the quality of child nutrition and aid in the fight against child overweight and obesity in the U.S. have included initiatives such as the National School Lunch Program (NSLP), comprehensive school health programs (CSHP), the Child Nutrition and WIC Reauthorization Act of 2004, the National School Lunch Act, farm-to-school programs, and garden-based nutrition education (Bagdonis et al., 2009; Conner et al., 2011; Graham, & Zidenberg-Cherr, 2005; Izumi et al., 2006). Additionally, Reichmann (2009) suggests that increasing intake of fruits and vegetables along with behavior and environmental modifications can aid in weight management for children and adolescents.

Garden-based learning

Garden-based learning (GBL) has been proposed as a possible aid in the struggle against child obesity and poor nutrition. Schools across the country have adopted, in various forms, learning in outdoor classrooms, school gardens, and nutrition education to not only address child nutrition, but many other aspects of children's lives, such as physical activity, community, and other academic disciplines (Bucklin-Sporer & Pringle, 2010). Figure 1 (Pivcevic, 2011, p. 35) illustrates a research-based framework that recognizes the link between the school community and the importance of connecting nutrition and performance.

Figure 1. Connecting Nutrition and Performance

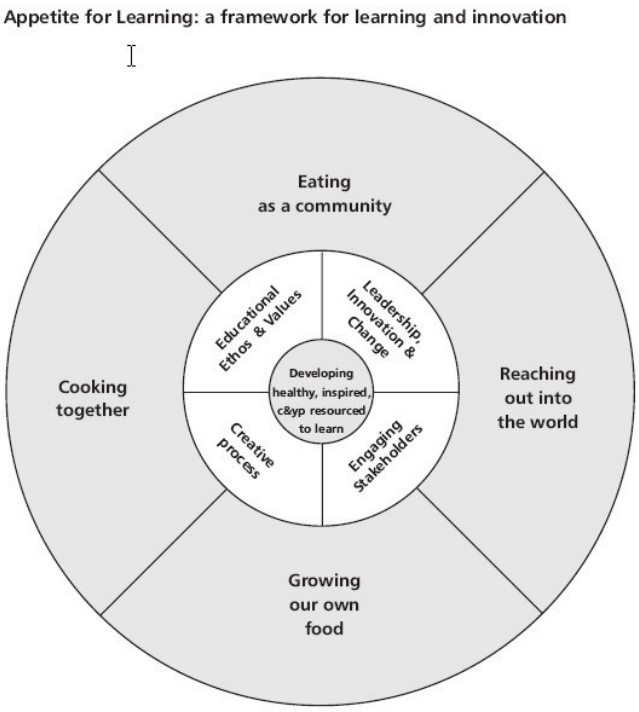

Figure 1. Pivcevic (2011) developed this framework based on his research about the complexity of change that relates the school, community and environment together as one sustainable entity.

School gardens provide a "real world context" for students, instead of just simulating real world experiences through activities such as planning, planting, tending, harvesting, and consuming produce (Ratcliffe, 2007, p. 12). Gardening programs provide opportunities "beyond basic classroom instruction to get children back outside to enjoy nature—away from all the instant-gratification devices" (Lamp'l, 2012) that can also promote physical activity (Domenghini, 2011). Not only has garden-based learning been shown to improve health-related attitudes and behaviors (Graham, Beall, Lussier, McLaughlin, & Zidenberg-Cherr, 2005; Graham & Zidenberg-Cherr, 2005; Hughes, 2003; Morris & Zidenberg-Cherr, 2002), but it also has positive effects on self-confidence, social skills, and leadership skills (Kids Gardening &

National Gardening Association, 2006). These improved social characteristics will help children in school, but also throughout life. Petty's (1993) data from the Occupational Work Ethic Inventory reported that students who had higher levels of initiative, dependability, and positive attitudes toward oneself were more likely to achieve academic success (as cited in Fox & Grams, 2007). Positive significant correlations between school garden-engagement and perceived competence, intrinsic motivation, and autonomy were found in a study by Skinner and Chi (2012) that was designed to explore the motivational processes involved with garden-based learning.

Goals. The most recent rise in garden-based learning and school gardening came from initiatives that included experiential learning and relevance to real-world context. "The true value of a school garden lies in its ability to be used as a classroom where regular school subjects intertwine with real-world experience, where even standards-based learning organically grows" (Hill, 2012, para. 6). Garden-based learning is broad enough in scope that it can be used to teach academic content in almost any discipline (Hemenway, 1903). Through their survey of California public school principals, Graham et al. (2005) found that the most frequent reasons for having a school garden were enhancing academic instruction (86%), providing extracurricular activities (60%), and providing edible produce (39%). In a similar study, Graham and Zidenberg-Cherr (2005) surveyed fourth grade teachers in California public schools and found that the most frequent reported reason for having a school garden was for the enhancement of academic instruction, which accounted for 72% of teacher respondents. As cited in Skinner and Chi, (2012), school gardens ultimately have four goals for participating students: (a) science learning and school achievement, (b) ecological and environmental awareness and responsible behaviors, (c) knowledge about food systems and nutrition, and (d) positive youth development

(Ratcliffe, Goldberg, Rogers, & Merrigan, 2010). Consequently, recent advocates are keenly interested in child nutrition and how gardening activities may enhance children's knowledge of healthy eating choices and behaviors. The primary goal of *Nutrition to Grow On* is to "teach children about healthy eating habits while simultaneously teaching them where their food comes from by letting them plant and harvest their own vegetables" (Morris, Koumjian, Briggs, & Zidenberg-Cherr, n.d., p. 175). The curriculum in *Nutrition to Grow On* consists of nine unique lessons that use the garden as a method to enhance nutrition.

Meta-analysis of 11 studies

Robinson-O'Brien, Story, and Heim (2009) conducted a meta-analysis of the impact of garden-based youth nutrition intervention programs that included studies conducted from 1990 to 2007. Based upon objectives and research design from Robinson-O'Brien, Story, and Heim (2009), more recent studies, as well as some included in their study, were analyzed by the researcher for the purpose of this literature review. Studies were chosen by similarity to the study with regard to program design, participants, data collection method, and results.

Several aspects of the studies were reviewed, and according to the findings of these 11 studies conducted from 2000 to 2011, gardening may provide unique and valuable opportunities for children to improve fruit and vegetable knowledge (Morris & Zidenberg-Cherr, 2002), recognition (Somerset & Markwell, 2009), preference (Heim, Stang, & Ireland, 2009; Morris & Zidenberg-Cherr, 2002), and willingness to try (Heim, Stang, & Ireland, 2009; Hermann et al., 2006; Morgan et al., 2010; Morris, Neustadter, & Zidenberg-Cherr, 2001). Other studies found evidence that supports the notion of gardening improving other developmental characteristics of children's lives as well. Overall, the aims of the existing studies is somewhat related, but they differ in that some are program objectives and others are goals of the actual study.

Objective. Among themes present in the program or study objectives, fruits and vegetables were found often, as well as other nutritional behavior, including intake, preference, attitudes, willingness to taste, and nutrition knowledge. Several studies aimed to increase fruit and vegetable consumption, preference, or willingness to taste (Lineberger & Zajicek, 2000; McAleese & Rankin, 2007; Morgan et al., 2010; O' Brien & Shoemaker, 2006; Poston, Shoemaker, & Dzewaltowski, 2005) while others focused on attitudes or perceptions of fruit and vegetables (Heim, Stang, & Ireland, 2009; Somerset & Markwell, 2009). Hermann et al., (2006, p. 201) studied a garden-based program that meant to "actively involve children in hands-on nutrition, food preparation, food safety, and physical activity education." The purpose of evaluation was to determine the impact of an after-school gardening program on vegetable intake and physical activity in elementary and middle-level students. A hands-on approach was also taken by the program evaluated by Anderson and Swafford (2011) to improve the sensory appeal of fruits and vegetables as well as availability. Overall, these studies aimed to evaluate whether or not the programs were effective in increasing children's positive nutritional behaviors.

Design and participants. Program design also varied between studies, as most of the gardens were implemented within the school curriculum during the day, but some of them were after-school or out of school in another format. Heim, Stang, and Ireland (2009) studied a 12-week summer program that consisted of a garden-based nutrition intervention in which students learned about and participated in gardening activities twice weekly. Two after-school gardening programs were also studied (Hermann et al., 2006; O'Brien & Shoemaker, 2006) ranging from 80 to 450 minutes per week, incorporating gardening into after-school activities. The in-school programs varied in design and content, as one study (Anderson & Swafford, 2011) evaluated students working with a hydroponic garden within the career and technical education program at

a high school. Other programs (Lineberger & Zajicek, 2000; McAleese & Rankin, 2007; Morgan et al., 2010; Morris & Zidenberg-Cherr, 2002) incorporated garden-based activities into regular school curriculum for a multi-week program in grades ranging from kindergarten through eighth grade. More extensive programs were evaluated by Morris, Neustadter, & Zidenberg-Cherr (2001) and Somerset & Markwell (2009) that involved garden-based curriculum incorporated into the school curriculum for one and two years, respectively. Participants in these studies were all children, with only one study (Anderson & Swafford, 2011) focusing on high school. The largest age range of participants was studied by Hermann et al. (2006) with the students ranging from kindergarten to eighth grade. All other studies evaluated smaller age ranges of students from first to seventh grades. Tables 1 and 2 list the studies analyzed for this purpose, and follow similar formats to Figure 1 in Robinson-O'Brien, Story, and Heim (2009). Table 1 shows program design and participants for each study.

Table 1

Program Design and Participants

Study	Program Design	Participants
Anderson & Swafford, 2011	In school, Students in CTE courses were involved in set-up, care, and maintenance of hydroponic gardens, as well as participated in data collection on plant growth. Students took home produce and analyzed nutritional content.	30 students enrolled in CTE classes at a rural high school
Heim, Stang, & Ireland, 2009	Summer, 12-week garden-based nutrition intervention within a YMCA summer camp; students learned about and participated in various gardening activities twice per week	93 children entering 4th to 6th grades who participated in a YMCA summer camp
Hermann et al., 2006	After-school, five days per week for 90 minutes, garden-based nutrition education, planting, watering, weeding, etc., food preparation, food safety	43 K-8 children at a rural school

Lineberger & Zajicek, 2000	In school, 10 units of garden-related material introduced in regular curriculum by schoolteachers	111 3rd -5th grade students from five elementary schools
McAleese & Rankin, 2007	In school, Food-recall workbook completion, 12-week garden intervention that included maintenance, weeding, watering, and harvesting. Other garden and food experiences were incorporated into the program as well.	122 6th grade students at 3 similar elementary schools
Morgan et al., 2010	In school, 10-week, delivered by classroom teachers	127 students in two primary schools in Australia
Morris, Neustadter, & Zidenberg-Cherr, 2001	Nutrition and garden-based activities incorporated into school curriculum for one year	97 1st grade children in three classrooms
Morris & Zidenberg-Cherr, 2002	In school, 9 nutrition lessons, each with a corresponding garden activity, lessons include a family newsletter,	200 fourth grade students
O' Brien & Shoemaker, 2006	After-school, 10-week garden club; JMG curriculum was used, balance between gardening and nutrition education, 80 minutes per week	4th grade students from two elementary schools
Poston, Shoemaker, & Dzewaltowski, 2005	Out of school, 8-lesson curriculum, once per week, Junior Master Gardener and Professor Popcorn	3rd-5th grade students recruited from Boys and Girls Club
Somerset & Markwell, 2009	In school, garden based activities incorporated into school curricula for two years, 11 hours per week	4th-7th graders in a primary school in eastern Australia

Data collection and results. All programs were evaluated using a pre-post measurement tool to determine if there were significant differences after the garden-based activities, whether in school, out of school, at the primary, or secondary level. Some studies provided control or comparison groups to compare with the experimental or intervention groups of participants. See Table 2 for the data collection method and results of each study.

Table 2

Data Collection Method and Results

Study	Data Collection Method	Results
Anderson & Swafford, 2011	Pre-post measurement	No significant change in student BMI, intent to consume more fruits and vegetables, and fruit and vegetable consumption during the 2-year study period.
Heim, Stang, & Ireland, 2009	Pre-post measurement	Significant increase in fruits and vegetables ever eaten and vegetable preference; no change in self-efficacy or snack preferences; significant increase in child asking behavior
Hermann et al., 2006	Pre-post measurement	Significant increase in children response to eating vegetables and being active every day
Lineberger & Zajicek, 2000	Pre-post measurement	Significant difference found in vegetable preference, but no significant difference in fruit preference; no significant difference in fruit or vegetable intake
McAleese & Rankin, 2007	Pre-post measurement, experimental and control groups	Significant increase in fruit and vegetable consumption as well as vitamins A and C in the experimental group.
Morgan et al., 2010	Pre-post measurement, quasi-experimental	Significant increase in willingness to taste vegetables and ability to identify vegetables; no significant difference found for fruit and vegetable consumption
Morris, Neustadter, & Zidenberg-Cherr, 2001	Pre-post measurement, experimental and control groups	No significant difference in preference or ability to identify vegetables, but students in the experimental group were more willing to try vegetables than the control group
Morris & Zidenberg-Cherr, 2002	Nutrition knowledge and vegetable preferences were assessed by lesson	Significant improvements in both vegetable preferences and nutrition knowledge
O' Brien & Shoemaker, 2006	Pre-post measurement, quasi-experimental, experimental and control groups	No significant differences in nutrition knowledge, fruit or vegetable preferences, or self-efficacy
Poston, Shoemaker, & Dzewaltowski, 2005	Pre-post measurement, quasi-experimental, experimental and	No significant difference in fruit or vegetable preferences

	comparison groups	
Somerset & Markwell, 2009	Pre-post measurement	Significant improvements in fruit and vegetable recognition

Of the 11 studies, significant differences were found in four, non-significant differences were found in three, and both significant and non-significant findings were reported in four studies. Anderson and Swafford (2011) found no significant change in their high school students' BMI scores, or intent to consume or actual consumption of fruits and vegetables. Other studies were similarly non-significant in findings, as Lineberger and Zajicek (2000) also found no significant difference in intake, nor were there significant differences in fruit preference (Morris, Neustadter, & Zidenberg-Cherr, 2001; O'Brien & Shoemaker, 2006; Poston, Shoemaker, & Dzewaltowski, 2005). Heim, Stang, and Ireland (2009) measured self-efficacy, snack preferences, and child asking behavior, but also found no significant increase in these factors after the program. Self-efficacy was also evaluated by O'Brien and Shoemaker (2006) but their results were also non-significant.

Significant findings in both vegetable preferences and nutrition knowledge were reported by Morris and Zidenberg-Cherr (2002) as well as fruit and vegetable recognition by Somerset and Markwell (2009). Two studies (Morgan et al., 2010; Morris, Neustadter, & Zidenberg-Cherr, 2001) found a significant increase in willingness to taste vegetables compared with the control group. Also, Hermann et al. (2006) found a significant increase in the participants' daily physical activity. These findings suggest that garden programs both in and out of schools may increase children's healthful behaviors. Morris and Zidenberg-Cherr (2002) found that not only did the nutrition curriculum significantly improve fourth-grade students' nutrition knowledge after the program, but the results were retained at the six-month follow-up study. This nutrition

education program also improved the students' preference for several vegetables. McAleese and Rankin (2007) reported significant increases in fruit and vegetable consumption among sixth-grade students after participation in a 12-week school garden program. Somerset and Markwell (2009) found an improvement in the ability of students to name certain fruits and vegetables that were incorporated in their intervention program. Also, awareness of peer preferences and consumption was recognized during the study in sixth and seventh grades, as well as a sense of self-efficacy to prepare fruits and vegetables was found in grade six.

Each study had its own strengths and weaknesses, and overall, the findings were somewhat scattered, hence the reason why more research should be conducted in the school gardening arena to determine if gardens are an effective avenue for teaching children. Small sample size and self-reporting were common limitations of the studies, and other limitations reported included no control group, non-randomization in sample, short term studies, and inconsistent attendance among participants. Recommendations for future research included more long-term studies, larger sample sizes, comparison groups, and incorporation of a more comprehensive gardening curriculum in one program. Other factors were also recommended to be studied more extensively such as program length and delivery, specific aspects of the program (gardening time, method, season, alternate settings), and other factors contributing to outcome such as gender, socioeconomic status, and parental involvement. In response to these calls for future research, this study utilized a comparison group with which the intervention group could be compared. In addition, gender was one factor analyzed in this study.

Effectiveness of garden-based learning

In addition to these 11 studies, other research has been conducted on garden-based education, and the findings are somewhat mixed. A study by Poston, Shoemaker, and

Dzewaltowski (2005) compared a gardening and nutrition program with a standard nutrition program and found no improvement in nutrition knowledge before or after the programs. A systematic review conducted by Knai, Pomerleau, Lock, and McKee (2006) found that multi-component interventions within nutrition education programs were the most effective in increasing fruit and vegetable consumption. This multi-component concept often incorporates different types of learning and instruction into one program. In a study of almost 400 low-income, mostly minority students in third through fifth grades, it was found that after a school-based multicomponent nutrition program improved students' knowledge, attitudes, and beliefs toward fruits and vegetables, but no significant different was found regarding fruit and vegetable consumption (Prelip, Kinsler, Le Thai, Toller Erausquin, & Slusser, 2012). Parmer, Salisbury-Glennon, Shannon, and Struempler (2009) found that school gardens can in fact increase fruit and vegetable consumption and ultimately cause behavior change in children, and therefore should be utilized by schools to increase healthy dietary behaviors.

Program design and implementation may play an important role in effectiveness of the program. Results from the survey by Graham et al. (2005), showed that school gardens were most commonly found in K-8 schools and were used to teach some core academic subjects. The integration of gardening into core curriculum to be incorporated into classrooms daily may be the most effective form of implementation. The 2008 South Carolina School Garden Survey Results revealed that school gardens are a valuable, productive part of the school (Derks, 2008). However, as discussed previously, enhancing core curriculum is not the goal of all garden-based education programs. According to Ozer (2007), many reports of "healthful youth development outcomes" of garden-based learning have emerged in recent years (as cited in Robinson-O'Brien, Story, & Heim, 2009).

From Our Farms in New Jersey is a program designed to help connect children and parents with farming and the community effects of supporting local agriculture. The *From Our Farms* telephone survey of 77 participants' parents revealed that over 80% of the participants tried a new fruit or vegetable, learned how fruits and vegetables grow, planted a garden, visited a farm stand or market, and purchased local produce (Hughes, 2003). A follow-up after an initial evaluation of the *Nutritious and Delicious Garden* program, results showed that children reported a significant increase in the number of fruits and vegetables they consumed (Heim, Stang, & Ireland, 2009). This program was a 12-week nutrition intervention that was given at a YMCA summer camp of children from fourth to sixth grade. Ratcliffe (2007) found that, after evaluating a school garden program involving middle-level students, participants increased their ability to correctly identify vegetables, tried significantly more vegetables than before the program, and consumed more variety of vegetables. Also found was that participants significantly increased their overall environmental science knowledge score after participation in the garden program (Ratcliffe, 2007).

After-school gardening programs may also provide benefits to children even though the content is not incorporated into daily classroom curriculum. After-school programs have been shown to enhance children's development in several ways, both academically and individually. An estimated 6.5 million kindergarten through twelfth grade students participate in after-school programs in the U.S. After-school programs emerged from three important concepts of child-care: safety, positive youth development, and academic enrichment and support (Little, Wimer, & Weiss, 2007). Table 3 displays the synthesis of literature on after-school programs by Little, Wimer, and Weiss (2007) and illustrates the positive outcomes associated with participation in after-school programs.

Table 3

Outcomes of After-school Participation (Little, Wimer, & Weiss, 2007)

Academic Outcomes	Social/Emotional Outcomes	Prevention Outcomes	Health and Wellness Outcomes
• Better attitudes toward school and higher educational aspirations • Higher school attendance rates and less tardiness • Less disciplinary action • Lower dropout rates • Better performance in school, as measured by achievement tests scores and grades • Greater on-time promotion • Improved homework completion • Engagement in learning	• Decreased behavioral problems • Improved social and communication skills and/or relationships with others • Increased self-confidence, self-esteem, and self-efficacy • Lower levels of depression and anxiety • Development of initiative • Improved feelings and attitudes toward self and school	• Avoidance of drug and alcohol use • Decreases in delinquency and violent behavior • Increased knowledge of safe sex • Avoidance of sexual activity • Reduction in juvenile crime	• Better food choices • Increased physical activity • Increased knowledge of nutrition and health practices • Reduction in BMI • Improved blood pressure • Improved body image

After-school garden programs are growing in popularity and are having significant effects on participating children. Hermann et al. (2006) studied an after-school program that met five days per week for 90 minutes a day. Students participated in gardening activities such as nutrition education, planting, watering, weeding, food preparation, and food safety practices. After evaluation of the program, significant increases were found in the children's responses to eating vegetables and being active every day. Another after-school program was a 10-week garden club that used the *Junior Master Gardener* curriculum, which is designed to help children "develop leadership and life skills to become good citizens within their communities, schools,

and families" (Seagraves et al., 1999, p. iii). For the 80 minutes per week spent at garden club, time was split between gardening activities and nutrition education. After a pre-post evaluation of the children, O'Brien and Shoemaker (2006) found no significant differences in nutrition knowledge, fruit or vegetable preferences, or self-efficacy. This after-school program had considerably less time each week than similar studies, which could have influenced its effectiveness. According to Lekies and Eames Sheavly (2007), length of time spent in the garden and participation in planning and management of the garden were important factors that affected children's interest in gardening. Gardening skills, however, had the largest impact on students' gardening interests.

Barriers to implementation and effectiveness of garden-based learning

Like any concept designed to educate young children in an alternative form, garden-based learning has faced several barriers that could be hindering its potential value. In a study by DeMarco, Relf, and McDaniel, (1999, p. 276), the three most important factors to successful implementation of garden-based learning were "1) student and faculty ownership or commitment to integrating gardening in their curriculum, 2) availability of physical resources, and 3) faculty knowledge and skill in the application of gardening to enhance an interdisciplinary curriculum." On the other hand, Graham and Zidenberg-Cherr (2005) reported that in a study of teacher perception of school gardens, time was the number one barrier (67%) to implementing academic instruction related to the school garden. Other barriers reported included lack of teacher interest in gardening (63%), lack of teacher experience in gardening (61%), lack of curriculum related to academic standards (60%), lack of teacher knowledge of gardening (60%), and lack of teacher training in gardening (58%). In an effort to empower teachers to teach using the outdoors, Tal and Morag (2009) found that lack of teacher preparation and student motivation as well as

student behavior were all issues faced during an outdoor learning activity. This lack of motivation and knowledge may improve if, as a whole, people better understood the communal benefits of the integration of schools and gardens. People's collective sense of efficacy can serve as a strong force for improvement in overall health (Bandura, 1998), therefore, gardens must be seen by an entire school community as a positive catalyst of change in children's health and well-being.

Theoretical Perspective

According to Hungerford and Volk (1990, p. 257) "the ultimate *aim* of education is shaping human behavior." Garden-based education aims to shape children's views and behaviors about healthy eating and ultimately improve their quality of life. School gardens and other forms of garden-based learning can be incorporated into curriculum and instruction through a grounded set of theoretical perspectives and offer unique learning experiences that are supported by educational theories. "School garden programs and curricula build on models of hands-on, problem-based environmental and science education" (Ozer, 2007, p. 847).

Childhood as ideal time for learning. Piaget's cognitive development theory was chosen for the explanation of how a nutrition education program should be designed to most effectively teach preschool-age children about healthy behaviors (Baskale, et al., 2009). The authors suggest that Piaget's work allows educators to understand the cognitive development of children and that there should be a connection between cognition, learning, and behavior that is developmentally appropriate for each age group. Because children learn in stages and use schema to create meaning, childhood is an ideal time for learning about nutrition, especially fruits and vegetables (Lineberger & Zajicek, 2000). Gardening offers children a place to learn about nature but also to see and understand where their food comes from. Transformation of

plants and food takes place in a garden that children may not fully understand if they just read about it in a book. According to Piaget, (1964, p. 176),

> To know an object, to know an event, is not simply to look at it and make a mental copy or image of it. To know an object is to act on it. To know is to modify, to transform the object, and to understand the process of this transformation, and as a consequence to understand the way the object is constructed.

Children learn about nutrition, develop eating habits, and learn concepts that will create life-long behavior patterns as early as preschool age (Baskale et al., 2009). Sandeno, Wolf, Drake, and Reicks (2000) reported that eating behaviors are developed during childhood; therefore, nutrition education in school and for young children should be targeted as a possible solution to the child obesity problem. This is why school settings are an ideal place for children to receive nutrition education (Briggs et al., 2003; Foster et al., 2008; Izumi et al., 2006, Lanvin et al., 1992). Some believe that children should not grow up and develop without a close connection with nature. Gardening may provide that link to nature that many children lack. As stated in Warsh's (2011) article about *The Children's School Farm* created by Fannie Griscom Parsons: "Reformers and educators, who began to re-examine the relationship between children, nature, and education, developed nature-study and created school gardens to provide the experience of nature they believed necessary for proper child development" (pp. 83-84).

Environmental education. "Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution" (Stapp et al., 1969, p. 4). Gardening may provide opportunities for children to develop better attitudes about environmental education and could be an avenue for incorporating nature into school curriculum (Waliczek & Zajicek, 1999). The Garden Montessori School in Knoxville,

Tennessee is a preschool, elementary, and middle school that guides students through Maria Montessori's theory about "respect for the inherent value of the natural world, exploration of life sciences, and a sense of environmental awareness and responsibility" (Garden Montessori School, 2012, para. 4). At this school, the Savage Garden surrounds the school campus that allows nature to be incorporated into the everyday school lives of the children who attend. One of the critical components in environmental education is to "provide carefully designed and in-depth opportunities for learners to achieve some level of environmental sensitivity that will promote a desire to behave in appropriate ways" (Hungerford & Volk, 1990, p. 264), schools must incorporate garden-based learning into children's lives to begin to make the changes necessary for a healthier generation.

Social Cognitive Theory. Gardens can serve as a model for programs designed around the Social Cognitive Theory (SCT) by providing visual reinforcement (Morris & Zidenberg-Cherr, 2002). As proposed by Albert Bandura, observational learning is an important component of the SCT that includes attention, retention, production, and motivation (Woolfolk, 2004, pp. 317-318). Gardening provides opportunities for all of these stages through observing others and gardening as a group, learning about the process of planting and growing, and harvesting. Through the use of preference, self-efficacy, and outcome expectation instruments, O'Brien and Shoemaker's (2006) study involving an after-school gardening club supports the use of the SCT in gardening and nutrition research. Gardening has been shown to have positive effects on self-confidence, social skills, and leadership skills (Kids Gardening & National Gardening Association, 2006). Positive significant correlations between school garden-engagement and perceived competence, intrinsic motivation, and autonomy were found in a study by Skinner and Chi (2012) that was designed to explore the motivational processes involved with garden-based

learning. "In social cognitive theory, efficacy beliefs operate as one of many determinants that regulate motivation, affect, and behavior" (Bandura, 1998, p. 6). Students who are intrinsically motivated "employ strategies that demand more effort, process information more deeply, and use more logical information-gathering and decision-making strategies than students who are extrinsically oriented" (Herron, Magomo, & Gossard, 2007, p. 44).

Experiential and cooperative learning. Gardening is inherently comprised of experiential learning, as it takes involvement and a hands-on approach to accomplish the necessary tasks involved. School gardens provide opportunities for true hands-on, student-centered, experiential education (Bucklin-Sporer & Pringle, 2010; Klemmer, Waliczek, & Zajicek, 2005) as children who participated in gardening activities in science class had higher achievement scores than students who did not. After an analysis of writings on gardening, garden movements and school gardens, Ralston (2011) provides a conceptual framework advocating the use of gardens. He includes that gardens can be used as (a) moral spaces, (b) sources of social solidarity, (c) inter-generational bridges, and (d) sites of political contestation. Through gardening, students experience a multitude of concepts and concrete examples of how nature relates to their everyday lives. "A garden provides a space where students tangibly connect with the land in a way that permits a practical, profound understanding of the local and the global" (Gaylie, 2009, p. 28). The Partnership for the 21st Century Skills (2009) suggests that children should learn core subjects with a deeper understanding using their five real-world core themes of (a) global awareness, (b) financial, economic, business, and entrepreneurial literacy, (c) civic literacy, (d) health literacy, and (e) environmental literacy. Rye et al. (2012) asserts that the school garden provides a rich, real-world experience and students have ownership of something that is alive. They have the opportunity to conduct real research by manipulating

variables in the garden, recording and analyzing results (Rye et al., 2012). John Dewey once claimed that "experience is *of* and *in* nature" and that nature, including one's social environment, is conducive to a proper education (Ozmon & Craver, 2008, p. 128). Through garden-based learning, children can experience a true form of cooperative learning, which has been shown to improve social skills, self-esteem, self-direction, and role-taking abilities (Kagan, 1992). Planting, maintaining, harvesting, and all other aspects of the garden are rarely one-person tasks. Gardens promote shared decision-making (Gaylie, 2009) and other life skills such as teamwork, volunteerism, leadership, and communication skills (Bucklin-Sporer & Pringle, 2010, p. 32).

Chapter 3: Method

Purpose of the Study

The purpose of this study was to determine if three elementary school garden club programs influenced students' attitudes and behaviors regarding fruit and vegetable consumption. Eventually, information from this study may add to the literature to create a foundation for incorporating garden and other outdoor activities into public school curriculum frameworks. The study has been designed to evaluate the effectiveness of three after-school elementary garden club programs and activities sponsored by Apple Seeds, Inc. and to provide further information on elementary students' perceptions of fruits and vegetable consumption. School garden initiatives can have a significant impact on student, family, and community health and can bring about change within schools to create a healthier more community-oriented environment (Bucklin-Sporer & Pringle, 2010). Through pre-post questionnaires and interviews with participants, the following research questions were addressed.

Research Questions

1. Do garden club activities impact students' perception of their own consumption of fruits and vegetables?
2. Do students' perceptions of healthy eating behaviors change after participating in garden club?

Participants

Participants for this study were elementary students within three schools in a public school district in a mid-south region of the United States. The school district is located in a city with an estimated population of 75,102 in 2011 with approximately 18.5% of the population 18

years and under (United States Census Bureau, 2012). The school district has an enrollment of over 9,000 students, with 41% of the total student population eligible for free and reduced meals (Fayetteville Public School District, 2012). Out of the total 18 schools in the district, eight are elementary schools. The three elementary schools were chosen for this study based on their after-school garden club involvement with Apple Seeds, Inc. School A, B, and C serve as pseudonyms for each participating school. See Table 1 for school demographic information.

Table 1

School Demographics for the 2011-2012 school year. (Arkansas Department of Education Data Center, 2012)

		School A	School B	School C
Enrollment		538	388	528
Gender				
	Male	292	184	260
	Female	280	178	258
Race/Ethnicity				
	Two or More	75	36	23
	Asian	33	34	23
	African American	32	29	15
	Hispanic	31	39	9
	Native American/ Native Alaskan	5	4	5
	Native Hawaiian/ Pacific Islander	1	3	9
	Caucasian	395	217	434
Meal Status				
	Free	192	192	97
	Reduced	55	27	22
	Full Price	325	143	399
Grade level				
	K	109	58	89
	1	100	76	84
	2	88	57	88
	3	97	60	92
	4	84	56	80
	5	94	55	85
Student Program				
	Gifted & talented	59	28	59
	Migrant	1	2	4
	Limited English Proficiency	38	52	24
	Handicap	9	3	10
	Foster Child	0	1	0
	Special Education	71	51	64

Each of the chosen schools hosted an after-school garden club in which students in grades three through five participated once per week for approximately one hour. Students participated in the after-school garden club voluntarily. When parents were notified of the after-school garden club program, they were given a letter and informed consent form to describe the study and to allow their child to participate in the program. Once the signed parental consent form was obtained, each child signed his or her own assent form during the first after-school garden club session. Prior to beginning any parent or child contact, Institutional Review Board (IRB) approval was obtained through the University of Arkansas. Appendix A is the IRB approval notice for permission to begin the study.

Measures

The intervention in this study was a structured 10-week garden club program for one hour per week. Each school followed the same curriculum and lessons for each week. The same garden club leader coordinated and led each of the three garden club programs to keep delivery and guidance as consistent as possible. The curriculum used for the garden club program was a compilation of ten lessons designed for third through fifth grade students based on research of other garden club programs, and was developed by members of the program. Included in the lessons were activities based on gardening along with nutritional components to each lesson, including such concepts as eating in season, planting, harvesting, plant needs, composting, and preserving. See Appendix O for the garden club curriculum outline.

During this one-hour period each week, participating students arrived at the garden club meeting place immediately after the school day ended. Each garden club met at the respective school, either in the cafeteria, gym, or a classroom. Once students arrived and garden club convened, students were served a snack planned by the garden club leader and in association

with the planned activity for the day. This usually consisted of something the students were planting or learning about during the day's lesson, or some other kind of locally-grown, healthy snack. Garden club leaders described the snack and explained its origin, and other ways in which it could be eaten, in hopes of encouraging the students to try the snack.

Once the snack was finished, the day's lesson would begin. The garden club leader began each day's lesson and for the remainder of the hour (approximately 45 minutes) the students performed whatever activities were described in the curriculum for that week. An outline of curriculum topics is presented in Appendix O. Parents or guardians would then pick up the students once the after-school program was finished, and students convened the next week for the next similarly-structured garden club program lesson.

The comparison group for this study consisted of kindergarten through fifth grade students participating in an alternate after-school program, School Kids Connection (SKC). Parental consent, child assent, and IRB approval were obtained in the same way as the intervention group. This comparison after-school program did not have a structured curriculum and did not emphasize healthy eating or behaviors. Students also reported to their assigned location immediately after-school and participated in various activities planned by the SKC coordinator, ranging from playing outside to reading books to watching movies.

Instrument

The data collection instrument for the quantitative portion of this study was one section of the Farm-to-School Evaluation Toolkit developed in coordination with the University of North Carolina at Chapel Hill and the National Farm-to-School Network. The section from this toolkit that was used as the data collection instrument was the Fruit and Vegetable Neophobia Scales survey, which was created and validated by Hollar, Paxton-Aiken, and Fleming (2012). This

assessment was originally designed to evaluate the impact that farm to school programs have on children's food preferences, and in particular, fruits and vegetables. The Fruit and Vegetable Neophobia Scales were adapted from Pliner and Hobden's Adult Neophobia Scale (1992) to measure fruit and vegetable preferences specifically (Hollar et al., 2012). These scales were developed for children in third grade and above, and contain 22 questions total. Within the Farm-to-School Evaluation Toolkit, tips and guidelines for administering the Fruit and Vegetable Neophobia Scales survey were given. This study attempted to closely adhere to the guidelines listed in the toolkit to ensure the most valid results possible. According to the developers, this survey should take between ten and twenty minutes for a child to take, and can be administered at any time during the school day. Because the study was evaluating an after-school program, students took the survey immediately following the school day. Permission was obtained from one of the original developers of the survey for use in this study. See Appendix M for the approval letter and Appendix N for the Fruit and Vegetable Neophobia Scales questionnaire. This questionnaire contains the same questions as the original, but the questionnaire design and formatting was changed for purposes of this study. Two questions from the original survey were omitted which asked for the children's and teachers' names. For purposes of this study, each child was assigned a number and those numbers were placed at the top of each questionnaire to match pre- and post-questionnaires of individual students anonymously.

Procedure

Quantitative. To obtain quantitative data to analyze the effectiveness of the after-school garden club program, several statistical tests were conducted. The intervention group of students at each school participated in the after-school garden club program and the comparison group of each school participated in the SKC after-school program. On the day of the first after-school

garden club meeting, all consenting students, both in the intervention and comparison groups, were given the Fruit and Vegetable Neophobia Scale Survey pretest. Demographic questions were added to the pretest to obtain information about each participant. Then at the end of the 10-week garden program, both groups re-took the same survey, this time as a posttest to measure any difference in the variables. Students were not required to put their names on the surveys, and all information was kept as anonymous as possible. All surveys and data were kept confidential. Each student was assigned a number at the beginning of the program for pre- and post-test matching purposes. Questionnaires were destroyed after data collection and analysis was complete.

Qualitative. For the qualitative data collection portion of the study, interviews were conducted with garden club participants. A convenience sample of fifteen participants were chosen by the garden club leader to participate in one-on-one semi-structured interviews with the researcher to obtain more in-depth information about their participation in the after-school garden club program. The interview questions were developed based on review of the garden club objectives and garden club leaders' experience with the program. Interviews with the participants were conducted in a one-on-one format, recorded for accuracy, and transcribed for further analysis.

Analysis

Quantitative. Each question within the measurement instrument was analyzed and differences examined. Several rounds of data analysis determined if and how effective the garden club program may be for the participants, and specifically whether there were differences in student perceptions of fruit and vegetable consumption and healthy eating behaviors after the intervention. Optional responses for each question were assigned a value. All questions

contained four options. Some of the questions contained choices of *A lot, A little, Not very much,* and *Not at all.* The other questions contained choices of *Definitely, Probably, Probably not,* and *Definitely not.* Numbers 1 through 4 were assigned to each of the four responses for each question, beginning with *A lot* (1) and *Definitely* (1), and ending with *Not at all* (4) and *Definitely* not (4). Number values were assigned to create a numerical meaning to each of the participants' responses. First, a pretest-posttest design was used within each group to compare differences in scores before and after the intervention program. Each intervention group and comparison group was compared within each school, and then all intervention and comparison participants' scores were analyzed as larger samples. A paired samples *t* test was used to determine the difference in scores between the pretest and posttest among each of the six groups (two for each school) and then for the two larger groups (all intervention participants and all comparison participants). Determining differences in the individual groups allowed the researcher to understand if the intervention had an effect on the participants' scores.

A repeated measures analysis of variance (ANOVA) was conducted using SPSS to determine whether there were statistically significant differences between schools regarding garden club intervention questionnaire scores. A separate repeated measures ANOVA was conducted to determine whether there were statistically significant differences between genders regarding garden club intervention questionnaire scores. This allowed the researcher to determine if school or gender impacted the effectiveness of the intervention program on perceptions of fruit and vegetable consumption and nutrition attitudes measured by the Fruit and Vegetable Neophobia Scales questionnaire. An independent samples *t* test was also conducted between posttest scores of the intervention and comparison groups to determine if there was a

significant difference between the two groups of participants' scores after the intervention period.

Qualitative. Responses from each school were analyzed individually, and then put together as a participant group to determine commonalities. The qualitative data first underwent an open coding phase (Strauss & Corbin, 1998). Through inductive analysis, and using grounded theory (Glaser & Strauss, 1967), formulated meanings were identified for each response and inserted into a column next to each data cell. Formulated meanings were derived from key phrases, terms, or concepts from the individual responses. This formulation of embedded meanings was created so that themes and relationships could emerge from the raw data (Patton, 2002). After a formulated meaning was identified for each response, two additional rounds of coding were performed to determine themes among the data. Formulated meanings for each question were first analyzed as schools, and then combined for each question. This second more deductive phase (Strauss & Corbin, 1998; Teddlie & Tashakkori, 2009) of the qualitative data analysis consisted of the researcher becoming aware of categories or patterns that did not already have specific terms (Patton, 2002). Consequently, the researcher generated terms for these patterns and determined these as "themes" of the qualitative responses for each question.

Timeline

The timeline for this entire study was January 2013 to May 2014. All data collection took place from approximately March 2013 to May 2013, including the pre- and posttests completed by participants and interviews conducted by the researcher. The garden club programs began in mid-March 2013 and lasted for approximately ten weeks. During that time, the researcher administered the pretests during the first day and the posttests on the last day of the program. Also during this time, participants were selected at random to participate in one-

on-one interviews with the researcher. Once data collection was complete, the researcher began the data analysis phase of the project. Quantitative analysis took place first in order to determine if there were significant differences between the comparison group and experimental group scores on the Fruit and Vegetable Neophobia Scales questionnaire.

Chapter 4: Results

The purpose of this study was to determine if three elementary school garden club programs influenced students' attitudes and behaviors regarding fruit and vegetable consumption. This chapter presents findings of the analysis of elementary students' attitudes and behaviors regarding fruit and vegetable consumption before and after participating in an after-school garden club program (intervention) and the School Kids Connection (comparison) after-school program. Results are presented in multiple sections. First, participant demographic information is discussed, and then results associated with each of the research questions are presented. Research questions were divided into sections of how each was analyzed, either quantitatively or qualitatively. Research questions for this study were:

1. Do garden club activities impact students' perception of their own consumption of fruits and vegetables?
2. Do students' perceptions of healthy eating behaviors change after participating in garden club?

Participant Demographics

Participants in this study included elementary students in kindergarten through fifth grade in three separate elementary schools within the same mid-southern public school district. By the end of the after-school programs, some students had withdrawn, were participating in other activities, or were absent on the days that posttest questionnaires were disseminated. Therefore, not all students who took the pretest took the posttest. Of the 107 total pretest questionnaires collected, 24 were omitted due to attrition. Results of garden club participants who responded to the demographic questions are shown in Table 1.

Table 1

Intervention Group Participant Demographics (N = 33)

	School A		School B		School C		Total	
Grade	*n*	%	*n*	%	*n*	%	*n*	%
K	0	0.0	1	7.6	1	14.2	2	6.0
1	1	7.6	4	30.7	1	14.2	6	18.1
2	1	7.6	3	23.0	1	14.2	5	15.1
3	5	38.4	1	7.6	0	0	6	18.1
4	4	30.7	1	7.6	4	57.1	9	27.2
5	1	7.6	0	0	0	0.0	1	3.0
No response	1	7.6	3	23.0	0	0.0	4	12.1
Gender								
Male	6	46.1	4	30.7	0	0.0	10	30.3
Female	7	53.8	9	69.2	7	100.0	23	69.6
No response	0	0.0	0	0.0	0	0.0	0	0.0

Grade levels of garden club participants were dispersed among kindergarten (K) through fifth grade. Percentage of grade level within each school is represented in Table 1. Overall, there were the most participants (9) in grade four, and the least number of participants (1) in grade five. Gender demographics within each school garden club are presented in Table 1. There were over twice as many females (23) as there were males (10) among all garden club participants. Four participants did not complete the demographic portion of the questionnaire and were therefore omitted from the demographic portion of the analysis. Demographic information representing participants in the comparison group is displayed in Table 2.

Table 2

Comparison Group Participant Demographics (N = 46)

	School A		School B		School C		Total	
	n	%	*n*	%	*n*	%	*n*	%
Grade								
K	1	7.1	2	13.3	4	26.6	7	15.2
1	2	14.2	3	20.0	3	20.0	8	17.3
2	4	28.5	3	20.0	1	6.6	8	17.3
3	1	7.1	4	26.6	3	20.0	8	17.3
4	4	28.5	3	20.0	0	0.0	7	15.2
5	2	14.2	0	0.0	4	26.6	6	13.0
No response	1	7.1	1	6.6	0	0.0	2	4.3
Gender								
Male	5	33.3	11	68.7	6	40.0	22	47.8
Female	8	53.3	4	25.0	9	60.0	21	45.6
No response	2	13.3	1	6.2	0	0.0	3	6.5

Table 2 depicts grade level and gender demographic information for the comparison group of participants, which was the generic after-school program. Grade levels were more evenly distributed as a whole compared to the garden club participants, with the most participants (8) in grades one, two, and three, and the least number of participants (6) in grade five. There were 22 male participants and 21 female participants.

Quantitative Analysis Results

The research question examined through quantitative analysis included:

1. Do garden club activities impact students' perception of their own consumption of fruits and vegetables?

A paired samples *t* test was conducted to determine if there was a difference in pretest and posttest scores of the Fruit and Vegetable Neophobia Scales questionnaire within all intervention and comparison after-school clubs. Data from all three schools were combined for purposes of determining if there was an overall difference in the pre-and posttest among garden

club students' perceptions of fruit and vegetable consumption, as well as if healthy eating behaviors changed after participating in garden club. Table 3 displays the results from the garden club students' responses from the pretest and posttest.

Table 3

Paired Samples t-test Intervention Results among All Control Group Participants

	Pretest	*Posttest*
Mean	1.87	1.92
Variance	1.07	1.06
Standard Deviation	1.03	1.02
Observations	739	739
Pearson Correlation	0.5689	
Hypothesized Mean Difference	0	
df	738	
t Stat	-1.57	
P(T<=t) two-tail	0.11	
t Critical two-tail	1.96	

In the combined analysis of all students in garden club, there was a non-significant difference in students' perceptions of fruit and vegetable consumption and students' perceptions of healthy eating behaviors before the intervention (M=1.87, SD=1.03) and after the intervention (M=1.92, SD=1.02); $t(738)$=1.57, p=0.11. These results suggest that overall the garden club had no significant effect on students' perceptions of fruit and vegetable consumption or perceptions of healthy eating behaviors. The same analysis was conducted on all participants in the comparison group. Results from the paired two sample t test are displayed in Table 4.

Table 4

Paired Samples t-test Intervention Results among All Comparison Group Participants

	Pretest	*Posttest*
Mean	2.09	2.1
Variance	1.14	1.11
Standard Deviation	1.07	1.05
Observations	920	920
Pearson Correlation	0.47	
Hypothesized Mean Difference	0	
df	919	
t Stat	-0.15	
P(T<=t) two-tail	0.87	
t Critical two-tail	1.96	

In the combined analysis of all students in the comparison group, there was a non-significant difference in students' perceptions of fruit and vegetable consumption and students' perceptions of healthy eating behaviors at the beginning of the data collection period (M=2.09, SD=1.07) and after the data collection period (M=2.1, SD=1.05); t(919)=-0.15, p=0.87.

A paired samples t test was conducted on each question within both the intervention and comparison groups to determine if there were significant differences among participant responses to specific questions. There was no significant difference between the pretest and posttest responses for any question from the comparison group. The intervention group's dependent samples t tests resulted in no significant difference in all questions except questions four and five. Question four asked students "Will you taste a fruit if you don't know what it is?" There was a significant difference before the intervention (M=1.95, SD=0.91) and after the intervention (M=2.32, SD=1.02); t(36)=2.34, p=0.02 regarding question four. Question five asked students "Will you taste a fruit if it looks strange?" There was also a significant difference before the intervention (M=1.86, SD=.85) and after the intervention (M=2.19, SD=1.04); t(36)= -

2.32, p=0.03 regarding question five. These significant differences; however, were negative, meaning that after the intervention, students' attitude toward consumption of fruit decreased, as well as willingness to taste. Table 5 displays data analysis results of questions four and five.

Table 5

Paired Samples t-test Significant Difference between Pretest and Posttest

Question Four			Question Five		
	Pretest	*Posttest*		*Pretest*	*Posttest*
Mean	1.95	2.32	Mean	1.86	2.19
Variance	0.83	1.06	Variance	0.73	1.10
Standard Deviation	0.91	1.02	Standard Deviation	0.85	1.04
Observations	37	37	Observations	37	37
Pearson Correlation	0.49		Pearson Correlation	0.62	
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	36		df	36	
t Stat	-2.34		t Stat	-2.32	
P(T<=t) two-tail	0.02		P(T<=t) two-tail	0.03	
t Critical two-tail	2.03		t Critical two-tail	2.03	

An independent samples *t* test was also conducted between posttest scores of the intervention and control groups to determine if there was a significant difference between the two groups of participants' scores after the intervention period. Responses to each of the twenty questions from all participants were inserted into Microsoft Excel for analysis. An independent samples *t* test assuming equal variances was conducted. Results from this analysis are displayed in Table 6.

Table 6

Independent t-test between Intervention and Control Groups

	Intervention	*Comparison*
Mean	1.92	2.1
Variance	1.06	1.11
Standard Deviation	1.03	1.05
Observations	740	920
Pooled Variance	1.09	
Hypothesized Mean Difference	0	
df	1658	
t Stat	-3.35	
P(T<=t) two-tail	0.0008	
t Critical two-tail	1.96	

In the analysis between groups' posttest scores, there was a significant difference in students' scores between the intervention group (M=1.92, SD=1.03) and the control group (M=2.10, SD=1.05); $t(920)$= -3.35, p=0.0008. The relationship (Δ= -.16) was found to have a relatively small effect size.

A repeated measures analysis of variance was conducted to determine whether there were statistically significant differences between schools A, B, and C regarding garden club intervention questionnaire scores. The independent variable included three schools: A, B, and C. The dependent variable was the garden club students' average scores on the pretest and posttest. Tests of assumptions were conducted, and no outliers were found in the data, as assessed by inspection of a boxplot. Pretest and posttest scores from all schools were normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$). Scores on the questionnaire increased from pretest (M = 1.87, SD = 0.60) to posttest (M = 1.95, SD = 0.55) in School A. Scores on the questionnaire increased from pretest (M = 1.97, SD = 0.55) to posttest (M = 2.01, SD = 0.50) in School B.

Scores on the questionnaire increased from pretest ($M = 1.66$, $SD = 0.43$) to posttest ($M = 1.70$, $SD = 0.37$) in School C. Descriptive statistics for Schools A, B, and C are presented in Table 7.

Table 7

Descriptive Statistics from Analysis of Variance between Schools

	School	*Mean*	*SD*	*N*
Pretest	A	1.87	0.60	13
	B	1.97	0.55	13
	C	1.66	0.43	7
	Total	1.86	0.55	33
Posttest	A	1.95	0.55	13
	B	2.01	0.50	13
	C	1.70	0.37	7
	Total	1.92	0.49	33

The garden club intervention did not lead to a statistically significant change in scores on the questionnaire from the pretest to the posttest $F(1.00, 30.00) = .809$, $p > 0.05$ between schools A, B, and C. Results for the tests of within-subjects effects are represented in Table 8.

Table 8

Tests of Within-Subjects Effects for Change in Score between Pretest and Posttest

Source	*SS*	*df*	*MS*	*F*	*p*
Test	0.039	1.00	0.039	0.809	0.375
Error	1.462	30.00	0.049		

Figure 1 shows differences in pretest and posttest mean scores between Schools A, B, and C at a 95% confidence interval among garden club participants. The non-significant increase in group means can be seen by the bar height differences. Figure 1 shows that not only were there no significant differences between mean scores of each school, but there were no significant differences between pretest and posttest scores within each school.

Figure 1. Pretest and Posttest Scores by School

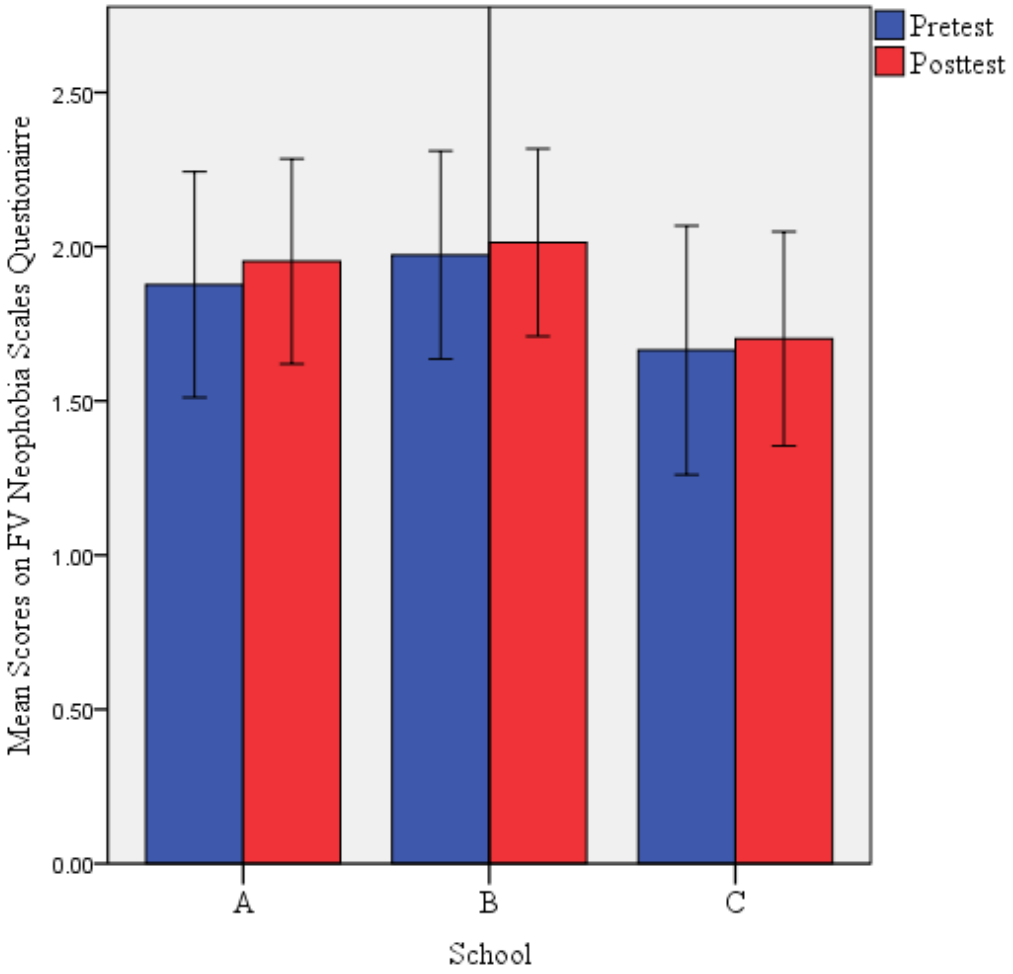

Figure 1. Error Bars: 95% Confidence Interval

Next, a repeated measures analysis of variance was conducted to determine whether there were statistically significant differences between gender regarding garden club intervention questionnaire scores. The independent variable included gender: male and female. The dependent variable was the students' average scores on the pretest and posttest. Tests of assumptions were conducted, and one outlier was detected through inspection of a boxplot. The

researcher included the single outlier in the analysis, as it was not considered erroneous or misrepresented data and was not expected to skew the results. Pretest and posttest scores from all schools were normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$). Scores on the questionnaire increased from pretest ($M = 1.85$, $SD = 0.54$) to posttest ($M = 1.89$, $SD = 0.47$) in females. Scores on the questionnaire increased from pretest ($M = 1.91$, $SD = 0.59$) to posttest ($M = 1.99$, $SD = 0.56$) in males. Descriptive statistics for gender are presented in Table 9.

Table 9

Descriptive Statistics from Analysis of Variance between Gender

	School	*Mean*	*SD*	*N*
Pretest	Female	1.85	0.54	23
	Male	1.91	0.59	10
	Total	1.86	0.55	33
Posttest	Female	1.89	0.47	23
	Male	1.99	0.56	10
	Total	1.92	0.49	33

The garden club intervention did not lead to a statistically significant change in scores on the questionnaire from the pretest to the posttest $F(1.00, 31.00) = 1.13$, $p > 0.05$. Results for the tests of within-subjects effects for gender are represented in Table 10.

Table 10

Tests of Within-Subjects Effects for Change in Score between Pretest and Posttest

Source	*SS*	*df*	*MS*	*F*	*p*
Test	0.05	1.00	0.05	1.13	.029
Error	1.46	31.00	0.04		

Figure 2 shows differences in pretest and posttest mean scores between males and females at a 95% confidence interval. The insignificant increase in group means can be seen by the bar height differences. This figure shows that not only was there no significant difference

between mean scores of males and females, but there was no significant difference between pretest and posttest scores.

Figure 2. Pretest and Posttest Scores by Gender

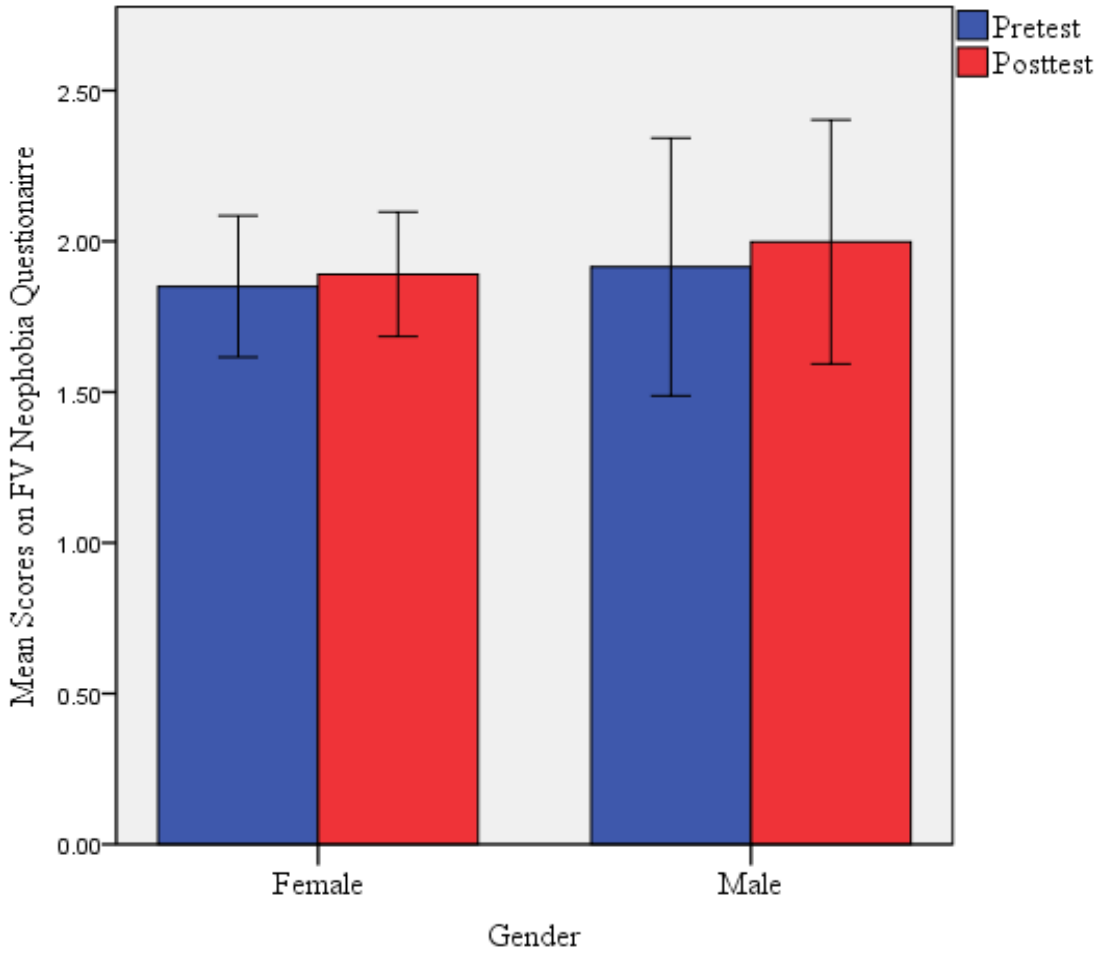

Figure 2. Error Bars: 95% Confidence Interval

Qualitative Analysis Results

The research question addressed through qualitative analysis was:

2. Do students' perceptions of healthy eating behaviors change after participating in garden club?

To determine if students' eating behaviors change outside of garden club, a qualitative approach was taken through one-on-one interviews between the researcher and participants. Interviews were conducted with a convenience sample of five students at each school during the after-school garden club time on the last day of the program. Students were asked a total of six open-ended questions about their experience within garden club that were designed to answer the research question regarding students continuing healthy eating behaviors outside of garden club, as well as to gain any additional information that might be useful for analysis of data collected. The researcher explained to each interview participant separately that the interview would be one-on-one, that the participant should answer thoroughly and honestly, and that the interviews would be recorded. Interviews were recorded with a portable digital voice recorder and later transcribed for analysis.

At School A, interviews were conducted between the researcher and the participant as they sat on a concrete area outside in the courtyard next to the school garden. Interviews were conducted one after another, and lasted approximately 10 minutes each, all during after-school garden club time. At School B, interviews were conducted similarly, but inside the school because of rain. The researcher and participants sat in a hallway outside the classroom where the other students were working and playing. At School C, students were also working inside because of rain. The researcher and interview participants sat inside a school gym to conduct the interviews while the garden club students were working and playing.

Each school's responses were analyzed individually, and then put together as a participant group to determine commonalities. The qualitative data first underwent an open coding phase (Strauss & Corbin, 1998). Through inductive analysis, and using grounded theory (Glaser & Strauss, 1967), formulated meanings were identified for each response and inserted

into a column next to each data cell in Microsoft Excel. Formulated meanings were derived from key phrases, terms, or concepts from the individual responses. This formulation of embedded meanings was created so that themes and relationships could emerge from the raw data (Patton, 2002). After a formulated meaning was identified for each response, two additional rounds of coding were performed to determine themes among the data. Formulated meanings for each question were first analyzed as schools, and then combined for each question. Each round of coding was inserted into a new column in Microsoft Excel to organize each new theme or meaning.

This second more deductive phase (Strauss & Corbin, 1998; Teddlie & Tashakkori, 2009) of the qualitative data analysis consisted of the researcher becoming aware of categories or patterns that did not already have specific terms (Patton, 2002). Consequently, the researcher generated terms for these patterns and determined these as "themes" of the qualitative responses for each question. Some responses garnered more than one formulated meaning or theme due to length of response or varying topics addressed by one answer. Significant statements (Onwuegbuzie et al., 2011) from each open-ended question's responses, formulated meanings, and emerging themes are represented by Tables 11 through 22.

Even though the qualitative portion of this study was to determine if students continued healthy eating behaviors outside of garden club, each question was created to gain insight into various aspects of attitudes and beliefs about garden club activities and healthy eating. Question one was formulated to determine why students participated in garden club. This question was meant to be an introductory question into the interview and to determine what motivation each participant had for being in garden club.

Question 1: Why did you decide to be in garden club?

Table 11

Question 1 Qualitative Analysis Selected Examples

Participant Response	Formulated Meaning(s)	Theme(s)
I decided to be in garden club because I like nature and I like to plant stuff and me and my mom are trying to make a garden in our back yard, and I thought maybe instead of just doing it in the yard, I could help with something else. And I just love wildlife.	• Like nature and planting • Garden at home • Mom involved • Desire to help with something more than just at home	• Nature • Interest in gardening • Parent/Sibling influence • Sense of community
I thought it would be fun to like, plant things, and because some of my friends were in there and I just wanted to visit them and I thought it would be really exciting.	• Thought gardening would be fun • Friends involved • Thought club would be exciting	• Interest in gardening • Friends • Have fun after school

Seven themes emerged from question one*: interest in gardening, friends, parent/sibling influence, sense of community, have fun after school, interest in nature,* and *keep busy.* Statements from participants were heavily focused on gardening itself, as well as how parents, siblings, or friends influenced them in some way to participate. Each response could elicit more than one theme, as shown in Table 11. Combined totals of prevalence rates (Onwuegbuzie, 2003; Onwuegbuzie & Teddlie, 2003; Onwuegbuzie et al., 2007) of each theme as well as prevalence rates at each of the three school sites are displayed in Table 12.

Table 12

Emergent Themes from Question 1: Why did you decide to be in garden club?

Theme	Prevalence Rate (%)					
	Combined	Male	Female	School A	School B	School C
Interest in gardening	40.7	27.3	72.7	36.4	18.2	45.5
Friends	11.1	33.3	66.7	33.3	33.3	33.3
Parent/sibling influence	14.8	25.0	75.0	50.0	0.0	50.0
Sense of community	3.7	0.0	100.0	100.0	0.0	0.0
Have fun after-school	18.5	40.0	60.0	20.0	80.0	0.0
Interest in nature	7.4	50.0	50.0	100.0	0.0	0.0
Keep busy	3.7	0.0	100.0	0.0	0.0	100.0

Note. Total percentages may not equal 100% due to rounding.

Reasons for participating in garden club varied widely in some areas and not as much in other areas. An interest in gardening had the highest prevalence rate overall, as well as in females at 72 percent. Gender differences were wide for this question, as some themes only came from males and others only from females. The most occurring reason for being in garden club in School A (N=4) and School C (N=5) was interest in gardening. The highest prevalence rate at School B was to have fun after-school, with eighty percent (N=4). School C did not have any participants who mentioned having fun after-school as a reason for being in garden club. Being with friends was equal across all three schools at thirty-three percent (N=1), but parent or sibling influence was only present in School A and C. In School C, parent or sibling influence had the second-highest prevalence rate. Having a sense of community, interest in nature, and keeping busy were only present in one out of the three schools, but not all from the same school.

Because interviews took place at the end of the garden club 10-week program, question two was formulated to determine what the participants learned or remembered from their weekly sessions. The purpose was for answers from this question would shed light into the focus of garden club activities and what students gained from participation.

Question 2: What is the most important thing you've learned in garden club?

Table 13

Question 2 Qualitative Analysis Selected Examples

Participant Response	Formulated Meaning(s)	Theme(s)
Um, probably to um, like take care of the plants and like make sure you water them enough, and don't ignore them every day and don't over water them.	• To water plants appropriately and take care of plants	• Garden care
Um, to take really good care of your garden, to treat it carefully.	• Take good care of the garden	• Garden care

Responses from question two evoked three themes: *respect nature, garden care,* and *healthy eating*. Participants largely responded with varying answers of the most important thing they learned in the garden club being about respecting nature and taking good care of the gardens. Some participants were specific in their answers, including statements about not stepping on flowers, and depth of planting seeds. Only one response discussed any aspect of eating, which was about taking vegetables and "turning them into things that taste good, like kale chips." Combined totals of prevalence rates (Onwuegbuzie, 2003; Onwuegbuzie & Teddlie, 2003; Onwuegbuzie et al., 2007) of each theme as well as prevalence rates at each of the three school sites are displayed in Table 14.

Table 14

Emergent Themes from Question 2: What was the most important thing you learned in garden club?

	Prevalence Rate (%)					
Theme	Combined	Male	Female	School A	School B	School C
Respect nature	43.8	57.1	42.9	71.4	14.3	14.3
Garden care	50.0	25.0	75.0	12.5	37.5	50.0
Healthy eating	6.3	0.0	100.0	0.0	0.0	100.0

Note. Total percentages may not equal 100% due to rounding.

Overall, the highest prevalence rate for the most important thing learned in garden club was garden care, closely followed by respecting nature. Some differences did occur between gender, in that three times as many females (N=6) responded that garden care was the most important thing they learned during the program. Also, one female responded that healthy eating was the most important thing she learned. Of the approximately 43 percent of respondents who said they learned to respect nature, four were males and three were females. At School C, one student mentioned healthy eating as the most important thing he or she learned. Respecting nature was the most prevalent theme at School A, while garden care was the most prevalent at School C.

Question three was designed to determine if students thought differently about healthy eating and the meaning of "healthy" because of participation in garden club. Students were asked this question with the purpose of understanding if students had different attitudes and beliefs about healthy eating after they participated in garden work and learning about fruits and vegetables.

Question 3: How has the garden club changed your attitude about eating healthy?

Table 15

Question 3 Qualitative Analysis Selected Examples

Participant Response	Formulated Meaning(s)	Theme(s)
Well I know more ways to um, cook that aren't exactly hard, but they're still good.	• Eating healthy can be easy and taste good	• Changed outlook on preparing healthy food
Um, well it really hasn't changed it because I always eat broccoli, and sometimes carrots, but sometimes I choke on carrots, um, snap peas…I love Thai food.	• No change in attitude • Hasn't changed attitude • Already able to identify healthy foods	• Already eats healthy

Five themes emerged from responses to question 3: *already eats healthy, aware of need to eat healthier, growing healthy food is possible, understand that food affects the body,* and *changed outlook on preparation of healthy food*. Overall, participants showed awareness of healthy eating concepts, but in various forms. Combined totals of prevalence rates (Onwuegbuzie, 2003; Onwuegbuzie & Teddlie, 2003; Onwuegbuzie et al., 2007) of each theme as well as prevalence rates at each of the three school sites are displayed in Table 16.

Table 16

Emergent Themes from Question 3: How has the garden club changed your attitude about eating healthy?

Theme	Prevalence Rate (%)					
	Combined	Male	Female	School A	School B	School C
No change	18.8	66.7	33.3	33.3	33.3	33.3
Already eats healthy	18.8	100.0	0.0	100.0	0.0	0.0
Aware of need to eat healthier	43.8	28.6	71.4	28.6	57.1	14.3
Growing healthy food is possible	6.3	0.0	100.0	0.0	0.0	100.0
Understands that food affects the body	6.3	0.0	100.0	0.0	0.0	100.0
Changed outlook on preparing healthy food	6.3	0.0	100.0	0.0	0.0	100.0

Note. Total percentages may not equal 100% due to rounding.

From the combined analysis, the highest prevalence rate for how the garden club changed attitudes about eating healthy was that students were more aware of the need to eat healthier, followed by the next highest rates, which consisted of students responding that they already eat healthy or that they experienced no change. More males (N=2) than females (N=1) responded that they did not experience a change in their attitudes about eating healthy. More females (N=5) responded that they are now aware of the need to eat healthier after participating in the garden club program than males did (N=2). Remaining responses were from females only. All three schools had an equal number (N=1) of respondents who answered that there was no change in attitude after participating in garden club. All respondents (N=3) who said they already eat healthy were from School A. Half of the responses from students who said they became aware of the need to eat healthier were from School B. School C was the only school with other themes, displayed in the last three rows of Table 11.

Question four was meant to determine if students noticed a change in themselves after participation in the garden club. This question asked specifically about eating behaviors, which was designed to determine if students thought they ate differently because of what they had learned and practiced in the garden club program.

Question 4: How has the garden club changed your eating behaviors outside the program?

Table 17

Question 4 Qualitative Analysis Selected Examples

Participant Response	Formulated Meaning(s)	Theme(s)
Yeah, usually after-school I'd eat some Goldfish, but now I usually eat yogurt.	• Eating healthier snacks	• Changed eating behavior
Uh, no, not really. I've always been eating healthy like that. My parents try to get me to eat healthy food.	• No change • Already eat healthy • Parent influence	• Family support for healthy eating is already present

Three themes emerged from question 4: *no change, improved eating behavior* and *already eats healthy.* No change represented students who responded that their eating behaviors did not change and did not provide further explanations. A relatively balanced number of respondents said that their eating behaviors improved to those students who responded that they already ate healthy diets. Combined totals of prevalence rates (Onwuegbuzie, 2003; Onwuegbuzie & Teddlie, 2003; Onwuegbuzie et al., 2007) of each theme as well as prevalence rates at each of the three school sites are displayed in Table 18.

Table 18

Emergent Themes from Question 4: How has the garden club changed your eating behaviors outside the program?

Theme	Prevalence Rate (%)					
	Combined	Male	Female	School A	School B	School C
No change	35.7	80.0	20.0	60.0	20.0	20.0
Improved eating behavior	50.0	28.6	71.4	28.6	28.6	42.9
Already eats healthy	14.3	50.0	50.0	0.0	100.0	0.0

Note. Total percentages may not equal 100% due to rounding.

The combined analysis for question four displayed in Table 18 represents the response rates between the three themes. More males (N=4) than females (N=1) responded that they did not experience a change in eating behaviors, and more females (N=5) responded that they improved their eating habits than did males (N=2). All three schools had participants respond that they experienced no change in eating behaviors outside the garden club program, with School A having the highest number (N=3). All three schools had students respond that their eating behaviors had improved, and Schools B had participants (N=2) who responded that they already eat healthy.

For the purpose of this study, "healthy eating" was not defined by the researcher, because the researcher did not want to skew what the participants' views of "healthy" was after what they had learned in garden club. However, question five of this portion of the study was designed to determine what the students thought constituted "eating healthy." This question was meant to determine what concepts students learned (or already knew) about eating healthy to ensure that they somewhat understood questions three and four. However, this study did not go into further analysis of definitions of healthy eating or what the students or parents thought was "healthy."

Question 5: What do you know about eating healthy?

Table 19

Question 5 Qualitative Analysis Selected Examples

Participant Response	Formulated Meaning(s)	Theme(s)
That there's a certain amount of things that you should eat, and not, like, for instance, junk food. You don't want to eat a lot of it because it has all these bad chemicals and stuff in it.	• Should not eat junk food	• Understands that junk food is unhealthy
You do want to eat healthy a lot, but you don't want to eat a lot of the same thing because it's not good. You don't want to eat anything unhealthy, but it's good every once in a while.	• Eat healthy • Eat a variety of foods • Eating unhealthy is alright on occasion	• Understands that food affects the body

Question 5 prompted participants to respond in a broad range of ways, but most responses were narrowed down to one theme: *food affects the body.* Three other themes that emerged were *diets should contain a variety of foods, food characteristics matter* and *eating unhealthy occasionally is alright*. These three themes did not change drastically in wording through the phases of analysis, because they were already in basic form, unlike most of the other responses. Combined totals of prevalence rates (Onwuegbuzie, 2003; Onwuegbuzie & Teddlie, 2003; Onwuegbuzie et al., 2007) of each theme as well as prevalence rates at each of the three school sites are displayed in Table 20.

Table 20

Emergent Themes from Question 5: What do you know about eating healthy?

Theme	Prevalence Rate (%)					
	Combined	Male	Female	School A	School B	School C
Food affects the body	76.5	23.1	76.9	30.8	30.8	38.5
Diets should contain a variety of foods	5.9	0.0	100.0	100.0	0.0	0.0
Food characteristics matter	5.9	100.0	0.0	100.0	0.0	0.0
Eating unhealthy occasionally is alright	5.9	0.0	100.0	100.0	0.0	0.0
Nothing	5.9	100.0	0.0	0.0	100.0	0.0

Note. Total percentages may n5.9ot equal 100% due to rounding.

The combined analysis among schools showed that over three-fourths of the participants (N=13) responded with answers about how food affects the body. Of the approximately 76 percent who responded that food affects the body, over three-fourths (N=10) of those respondents were female. Schools B and C had no other theme emerge except for one participant from School B who said that he knew nothing about eating healthy. School A had three other themes emerge, but were low in prevalence rates.

Question six was a closure question for the interview and was meant to more deeply understand the experience students had in garden club and to determine, similar to question one, what the students learned or enjoyed most about the program. Responses to this question six could determine what stood out most to students from the garden club, which could help researchers make recommendations to the garden club program coordinators.

Question 6: Would you participate in garden club again if you had the chance? Why or why not?

Table 21

Question 6 Qualitative Analysis Selected Examples

Participant Response	Formulated Meaning(s)	Theme(s)
Yes, because I think we would do different stuff next time	• Hopes to participate in different activities next time	• Would like to learn more
Yes, because it's been lots of fun doing this kind of stuff and I love to be outside	• Had fun • Enjoys being outside	• Enjoyed club activities

All responses to question six included a "yes" before the explanation of why they would like to participate in the garden club again, except for one student who said "probably." Five themes emerged from the explanations of why participants would like to be in garden club again if they had the chance: *enjoyed club activities, would like to learn more, friends, likes to eat healthy,* and *enjoys gardening.* Even though gardening is the main club activity, only three students specifically mentioned activities related to gardening in their response. Hence, there are two separate themes for club activities and for gardening. Several students used the word "fun" to describe club activities, which emerged into the theme *enjoyed club activities*. Combined totals of prevalence rates (Onwuegbuzie, 2003; Onwuegbuzie & Teddlie, 2003; Onwuegbuzie et al., 2007) of each theme as well as prevalence rates at each of the three school sites are displayed in Table 22.

Table 22

Emergent Themes from Question 6: Would you participate in garden club again if you had the chance? Why or why not?

Theme	Prevalence Rate (%)					
	Combined	Male	Female	School A	School B	School C
Enjoyed club activities	50.0	44.4	55.6	44.4	22.2	33.3
Would like to learn more	16.7	33.3	66.7	33.3	33.3	33.3
Friends	5.6	0.0	100.0	0.0	0.0	100.0
Likes to eat healthy	11.1	50.0	50.0	0.0	50.0	50.0
Enjoys gardening	16.7	0.0	100.0	0.0	33.3	66.7

Note. Total percentages may not equal 100% due to rounding.

All interview participants responded that they would participate in garden club again if they had the chance. The most prevalent reason (N=9) in the combined and separate analyses for wanting to participate again was that they enjoyed club activities. Of the participants who said they would participate again because they enjoyed club activities, approximately 55 percent were female (N=5). One male participant stated that he would participate again because he liked to eat healthy, as did one female participant. Each school had one participant respond with the desire to learn more. School C had themes of being with friends and Schools B and C contained participants who would like to participate again because they enjoy gardening and like to eat healthy.

Overall, results from the quantitative or qualitative phases were non-significant, which represents no significant change or improvement in students' perceptions of healthy eating attitudes and behavior. Qualitative analysis and discussion may shed some light into why no significant differences were found, as many themes emerged from the participant interviews. A discussion of these results is presented in the next chapter, including implications, assumptions, recommendations for further research, and limitations of the study.

Chapter 5: Discussion

The purpose of this study was to determine if three elementary school garden club programs influenced students' attitudes and behaviors regarding fruit and vegetable consumption. Participants in this study were children in grades kindergarten through fifth, in two after-school programs at three different elementary schools. The intervention groups of participants were members of three garden club programs, while the comparison groups were three after-school programs unrelated to gardening or nutrition. Data was collected and analyzed both quantitatively and qualitatively to provide information for better understanding effects of participation in a 10-week after-school garden club program on elementary students' attitudes and behaviors regarding healthy eating. Research questions that guided this study were:

1. Do garden club activities impact students' perception of their own consumption of fruits and vegetables?
2. Do students' perceptions of healthy eating behaviors change after participating in garden club?

The first research question guided the quantitative portion of the data collection and analysis, which consisted of a questionnaire that measured students' fruit and vegetable neophobia, or attitudes about fruits and vegetables. Students were given a pretest questionnaire and then given the same questionnaire at the end of the ten-week program. Both the intervention and comparison groups at each of the three schools received the same pretest and posttest questionnaire.

The second research question guided a qualitative data collection process and analysis, which included one-on-one interviews with randomly chosen participants from the intervention group. A convenience sample of five participants from each school was chosen to be

interviewed by the researcher. A set of questions was predetermined by the researcher based on the research question and research objectives. Interviews were recorded, transcribed, and the data was coded through a multi-stage process to formulate themes and meaningful assertions from participant responses.

Literature regarding garden-based education and the effect it has on students' attitudes, and consumption of fruits and vegetables is somewhat inconsistent. Therefore, it is difficult to say if this study is consistent with the literature. Of the pretest-posttest studies analyzed through the meta-analysis of garden-based education programs in Chapter Two, both significant and non-significant differences were found regarding participants' attitudes and consumption of fruits and vegetables. In this study, non-significant results were found in almost every analysis conducted; therefore, it could be concluded that the garden club program had little effect on participants' attitudes and consumption of fruits and vegetables.

Overall, results from this study showed non-significant differences between total participants in the intervention and comparison groups, between gender, and between schools, which is consistent with Anderson and Swafford (2011) who found no significant change in their high school students' intent to consume or actual consumption of fruits and vegetables. Other studies that found non-significant results included Lineberger and Zajicek (2000) who tested intake of fruits and vegetables. Several studies (Morris, Neustadter, & Zidenberg-Cherr, 2001; O'Brien & Shoemaker, 2006; Poston, Shoemaker, & Dzewaltowski, 2005) reported non-significant results in changes in fruit preference. Morris, Neustadter, & Zidenberg-Cherr, 2001 also found no significant difference in preference or ability to identify vegetables after their program intervention.

Through qualitative analysis, however, results suggest that the program did have an impact on some students' eating behaviors, as well as their attitudes about healthy food items. Forty-four percent of participant responses were found to fall under the theme that they were "aware of the need to eat healthier" after participating in garden club. Morris and Zidenberg-Cherr (2002) found that not only did the nutrition curriculum significantly improve fourth-grade students' nutrition knowledge after the program, but the results were retained at the six-month follow-up study.

During one interview at the end of the garden club program, one student responded that after the program, he or she has a changed outlook on preparing healthy food, while another participant understood that growing healthy food was possible. Of the students interviewed, 40% of students responded in a way that meant they have improved their eating behaviors since participating in the garden club program. These results are consistent with two studies (Morgan et al., 2010; Morris, Neustadter, & Zidenberg-Cherr, 2001) that found significant increases in willingness to taste vegetables from a pretest-posttest analysis. McAleese and Rankin (2007) reported significant increases in fruit and vegetable consumption among sixth-grade students after participation in a 12-week school garden program, which may also be supported by findings from this study.

Interpretation of Results

Quantitative. The purpose of the quantitative portion of this study was to address the following research question: Do garden club activities impact students' perception of their own consumption of fruits and vegetables? The study utilized a pretest-posttest design using a previously-validated fruit and vegetable neophobia questionnaire. Analysis of data occurred on multiple levels, as displayed in Table 1.

Table 1

Quantitative Analysis of Pretest-Posttest Measurement Data

Goal	Statistical Test Used
To determine whether there were statistically significant differences between pretest and posttest scores within all intervention and comparison groups.	Paired samples *t* test
To determine whether there were statistically significant differences between participant responses to individual questions.	Paired samples *t* test
To determine whether there were statistically significant differences between posttest scores of the intervention and comparison groups.	Independent samples *t* test assuming equal variances
To determine whether there were statistically significant differences between pretest and posttest scores among schools.	Repeated measures analysis of variance
To determine whether there were statistically significant differences between pretest and posttest scores among genders.	Repeated measures analysis of variance

The paired samples *t* test conducted to determine whether there were statistically significant differences between pretest and posttest scores within the intervention group established non-significant differences before the intervention (M=1.87, SD=1.03) and after the intervention (M=1.92, SD=1.02); $t(738)=1.57$, $p=0.11$. When the same test was conducted on the comparison group, non-significant results were also found at the beginning of the data collection period (M=2.09, SD=1.07) and after the data collection period (M=2.1, SD=1.05); $t(919)=-0.15$, $p=0.87$. These results suggest that participants' attitudes about and consumption of fruits and vegetables did not significantly change or increase after participating in either program. The

researcher did not expect participant responses from the comparison group to change from pretest to posttest because there was no focus on gardening, fruits and vegetables, or nutrition at all. After the paired samples *t* test was conducted to determine whether there were statistically significant differences between participant responses to individual questions on the fruit and vegetable neophobia questionnaire, non-significant differences were found within the comparison and intervention groups, with two exceptions. Negatively significant differences were found on two questions within the intervention group analysis, which implied that students' attitude toward consumption of fruit and willingness to taste fruit decreased after the garden club intervention. One possible explanation for this unexpected result could be that students tried certain fruits during the intervention program that they did not like, which therefore made them less likely to want to try new fruits in the future. Another possible explanation is that these results were due to participant error or misunderstanding of the questions.

The independent samples *t* test was conducted to determine whether there were statistically significant differences between posttest scores of the intervention and comparison groups. Significant results were found in students' scores between the intervention group (M=1.92, SD=1.03) and the comparison group (M=2.10, SD=1.05); $t(920)$= -3.35, p=0.0008. The relationship (Δ= -.16) was found to have a relatively small effect size. The repeated measures analysis of variance showed increases in pretest to posttest scores among all three schools, but not significant increases. Similar increases from pretest to posttest were found from the second repeated measures analysis of variance, but again, with non-significant results.

A possible explanation for the non-significant differences found from pretest to posttest within the intervention group could be that as an after-school program, it is not effective in improving children's attitudes about fruits and vegetables and other nutrition information. This

explanation is consistent with other studies that measured out-of-school garden-based programs and resulted in non-significant changes over time. Fourth grade students participating in a 10-week after-school garden club that used Junior Master Gardener curriculum for 80 minutes per week showed no significant differences in nutrition knowledge or fruit and vegetable preferences (O'Brien & Shoemaker, 2006). Similarly, a once-per-week program containing eight lessons for third through fifth grade students was analyzed by a pretest-posttest measurement, but no significant differences in fruit or vegetable preferences were found (Poston, Shoemaker, & Dzewaltowski, (2005).

Non-significant results could also be due to the limited amounts of time each week that students are exposed to the garden and nutrition curriculum. After-school garden-based nutrition education can have a positive effect on students' health behaviors, but perhaps if on a more regular basis. Kindergarten through eighth grade students who spent 90 minutes five days per week in a garden based nutrition education program that incorporated planting, watering, weeding of the garden, along with food preparation significantly improved their responses to eating vegetables and being active every day (Hermann et al., 2006). More days per week spent in the garden club could have possibly had a significant effect on students' posttest responses.

Another possible explanation is that nutrition and garden-based curriculum incorporated during the school day in the students' daily classrooms could provide a better foundation for improving knowledge and attitudes about healthy eating and fruit and vegetable consumption. Garden-based education provided to students during the regular school day can have a significant impact on vegetable preference (Lineberger & Zajicek, 2000; Morris & Zidenberg-Cherr, 2002) fruit and vegetable consumption (McAleese & Rankin, 2007), willingness to taste vegetables (Morgan et al., 2010; Morris, Neustadter, & Zidenberg-Cherr, 2001), fruit and vegetable

recognition (Morgan et al., 2010; Somerset & Markwell, 2009), and nutrition knowledge (Morris & Zidenberg-Cherr, 2002).

As expected by the researcher, the comparison of means through the analysis of variance between the three schools found non-significant results. These results were expected because the schools are all within the same school district, and the same garden club leader coordinated all three garden clubs and was present during every garden club session at all schools. The curriculum and activities planned for each garden club were the same or as similar as possible, depending on how many parent volunteers and resources were available each week. Gender differences within the intervention group were not significant either, as assessed by a second repeated measures analysis of variance. Further gender analysis occurred during the qualitative phase of the study and will be addressed in subsequent sections of this discussion.

Qualitative. The qualitative phase of this study consisted of identifying emerging themes from one on one interviews with five randomly selected participants from each of the three after-school garden club programs. A total of fifteen participants were interviewed by the researcher, interviews were recorded and transcribed, and data was analyzed to determine themes. Each question varied in complexity and emerging themes, but all were aimed toward addressing the research question, "Do students continue healthy eating behaviors outside of garden club?"

The first question, "Why did you decide to be in garden club?" was asked to gain insight into the motivation behind participation in the program. This question was the broadest question, which, in turn, yielded the highest number of themes. Seven themes emerged from the participants' responses: *interest in gardening, friends, parent/sibling influence, sense of community, have fun after-school, interest in nature,* and *keep busy*. An interest in gardening was the most prevalent theme, as was expected by the researcher. With alternate offerings of

after-school programs at each of the three schools, it was expected that an interest in gardening would be common among participants. However, an interest in gardening was mostly identified by females, as only 27 percent of those who answered similarly were male participants.

Question two was "What was the most important thing you learned in garden club?" Over half of all participant responses fell under the theme "garden care." Females made up 75 percent (N=6) of these responses, and half (N=4) of these responses came from School C. As the name "garden club" would suggest, one of the main foci of the program was in fact, gardening. Therefore, it could be expected that garden care would be one of the most commonly identified gains in learning among participants. More surprisingly, the second most common theme that participants learned was to "respect nature." Almost three-fourths (N=5) of these responses came from School A, and both School B and School C each contained approximately 14 percent (N=1) each. Respecting nature was not included in any of the objectives of the program, but was the most common response from participants in School A. This leads the researcher to believe that perhaps an incident occurred during one of the garden club sessions at School A that stressed to students the importance of respecting nature. One participant responded in a way other than what could fall under these two themes, which was "healthy eating." Even though a "healthy" snack was provided to students every session, still only one student described that eating in a way that was healthy one of the most important things learned over the 10 week time period. A possible explanation for this could be that much time was spent tending to the gardens and perhaps the connection between the gardens and the daily snack or other food preparation was not breached by the young participants.

Question 3 elicited five themes: *already eats healthy, aware of need to eat healthier, growing healthy food is possible, understand that food affects the body,* and *changed outlook on*

preparation of healthy food. Overall, the highest prevalence rate for how the garden club changed attitudes about eating healthy was that students were more aware of the need to eat healthier, followed by the next highest rate, which consisted of students responding that they already ate healthy. Almost two-thirds (N=2) of the participants who responded that they experienced no change were males, and three male participants responded that they already eat healthy, while no females responded similarly. Approximately 43 percent (N=7) of the responses were categorized under the theme "aware of the need to eat healthier" but almost three-fourths (N=5) of these responses were from female participants. All three schools had one respondent who answered that there was no change in attitude after participating in garden club.

Through interviews and analysis of transcripts, the researcher realized that many of the students participating in garden club had a previous awareness of gardening and some nutrition knowledge. For example, one participant stated that her father owns a local organic restaurant and helped build the raised beds for the school gardens. Another student identified his family as "health freaks" and that his parents only purchase organic food when shopping at the grocery store. These statements and others similar to them provided insight into the students who participated in garden club. A possible explanation for the many students who responded that they already eat healthy could be that they actually do. Participants' young ages suggest that family and parental influence is still strong in development of habits and attitudes toward eating and other lifestyle factors, as parental fruit and vegetable consumption has been shown to be a strong predictor of their children's fruit and vegetable consumption (Wardle, Carnell, & Cooke, 2005). Students participating in garden club could have been placed in garden club involuntarily by their parents, who are already knowledgeable about the benefits of gardening and proper nutrition for children.

Three themes emerged from question 4: *no change, improved eating behavior* and *already eats healthy.* Overall, the most prevalent theme, with fifty percent (N=7) of responses, was that eating behavior improved as a result of participating in garden club. Closely following with approximately one-third (N =5) of participants were those who responded that they experienced no change in eating behavior. No change represented students who responded that their eating behaviors did not change and did not provide further explanations. Eighty percent (N=4) of participants who did not experience a change in eating behaviors were males. On the other hand, 71% (N=5) of participants who responded they improved their eating behaviors were females. All three schools had participants respond that they experienced no change in eating behaviors outside the garden club program, with School A having the highest (N=3). All three schools had fairly equal numbers of students respond that their eating behaviors had improved with School C at the highest (N=3). There were no participants from Schools A and C who responded that they already ate healthy before they participated in garden club. Similar explanations to question three could provide insight into responses from question four. Several students in these garden club programs stated that they already ate healthy before participating in the program, which would leave little room for growth or improvement in healthy eating. Whether or not the students actually eat healthy and have no room for improvement was not addressed by this study. Students who responded that they experienced no change in eating behaviors could either have been affected by the program, or could have similar lifestyles to the group of students who said they already ate healthy, but just did not respond in that way.

Question 5 prompted four themes: *food affects the body, diets should contain a variety of foods, food characteristics matter* and *eating unhealthy occasionally is alright.* Well over three-fourths of them responded with answers about how food affects the body. Of the approximately

76 percent (N=13) who responded that food affects the body, over three-fourths (N=10) of those respondents were female. School A had three other themes emerge, but only from individual students, keeping prevalence rates low. Participants seemed to understand the connection between food and the body, with comments such as "Um, I know that some healthy foods people can be allergic to. And it helps…some foods help you digest other foods. And I think bananas do that. And they also give you energy and some have natural sugars that keep you healthy and active, and that's about all." Another participant responded that, "I know that eating healthy gives you strong bones and helps keep your body well." These comments and others from the interview transcripts led the researcher to believe that most participants understand that food does in fact affect the body, which is a connection they may not necessarily have learned from garden club. The question did not address what they knew about healthy eating as a result of participating in garden club, but rather about what they knew about eating healthy in general.

Question six was intended to provide closure to the interviews and to shed light on the participants' overall experience during their time in the garden club program. All interview participants responded that they would participate in garden club again if given the opportunity. The most prevalent reason for wanting to participate again was that the participants enjoyed club activities (N=9). Of the participants who said they would participate again because they enjoyed club activities, approximately 55 percent were female (N=5). Responses that students enjoyed club activities and that they would like to learn more were equally distributed among schools (N=1). The researcher concluded that the garden club experience was positive overall for participants, which could be helpful for the leaders of the garden clubs and parent volunteers at each school for future planning. Even though mostly non-significant results emerged in regard to attitudes and behaviors regarding fruit and vegetable consumption, the overall enjoyable

experience and exposure to gardening and nature could justify future sustainability of the programs, or possibly implementation of additional ones depending on available resources.

Limitations of the Study

This study's mix of quantitative and qualitative methods of data collection and analysis added some strength to the findings and possible implications provided by the researcher. As discussed in chapter two, previous research focused primarily on a pre-test post-test study design that provided quantitative data alone. This study included a pre-test post-test design as well as qualitative data collection in the form of interviews, which were analyzed and coded using grounded theory to determine themes in the data.

Limitations of this study existed, which restricted the researcher's ability to generalize findings and implications. First, this study was most limited by its small sample size. The sample size could have been larger if more students had continued through the program until the end of the ten weeks. Of the 107 total pretests collected from participants overall, 22% of those were omitted due to attrition. Some students had dropped out of the programs over the course of the process, leaving a much smaller number of total participants' scores used for data analysis. More schools could have been included in the study as well, which would have increased number of participants in both the intervention and comparison groups. An increased number of students would have not only strengthened the statistical analysis of the research, but would have provided deeper insight into the research questions addressed. A more diverse sample of participants would have strengthened results as well. In the intervention group, there were almost three times as many female participants as male participants. An increased number of interviews would have added more depth to the qualitative portion of the study, possibly prompting additional themes or different results in theme prevalence rates.

Another limitation of this study was participants' reading levels not appropriately aligning with the questionnaire reading level. The study was originally designed for third through fifth grade students, but much fewer students of this age enrolled in the programs than what was expected. Therefore, the researcher included all elementary grades (K-5) within the data collection process since both the intervention and comparison groups included all elementary grades. The questionnaire used was designed for a third-grade reading level, which required assistance for the youngest of the participants to read and comprehend. The researcher, along with other volunteers and garden club leaders, assisted participants who were unable to read and understand the questionnaire. Some participants still may not have fully understood some of the questions, which could have led to misrepresented data points and skewed results.

Recommendations for Future Research

It is recommended by the researcher that future research be conducted in the area of garden-based education to determine the most effective designs of implementation for improving children's attitudes about and consumption of fruits and vegetables. After-school programs should be analyzed to determine if garden-based education after-school can be successful in out-of-school environments, or if garden-based education is most effective when it is implemented within regular school day curriculum. Future research should include larger sample sizes, more diverse populations, and focus on children who are participating in required garden-based education. Voluntary participation in a program may skew the effectiveness due to previous interest or knowledge of the programs' initiatives.

Secondly, studies could be conducted to determine how garden-based nutrition education affects overweight or obese children, as child health is one common target of garden and nutrition programs. All students need exposure to fruits and vegetables and nutrition

information, but the overweight children are the ones who may need it the most. If garden-based education programs could be shown to alleviate some of the negative effects of being overweight as a child, then perhaps more funding and effort could be justified for improvement of existing programs and possibly even development of new garden-based programs.

Additional studies should be conducted involving both quantitative and qualitative data collection and analysis. Pretest-posttest study designs provide insight into measurable differences regarding garden based interventions, but interviews and other qualitative forms of data analysis can offer additional understanding of participant backgrounds, interests, and previous knowledge of the research objective. Additionally, collecting thorough demographic information could be helpful in recognizing certain populations that may be more in need of experience with not only garden-based education, but nutritional information and exposure to fruits and vegetables.

Future research should include long-term studies that follow children not only through a 10-week program, but through follow-up studies months and even years later. Child nutrition problems will not be fixed in a short period of time, therefore, research following the same child participants over longer periods of time would be beneficial to more deeply understand effects of nutrition education and garden-based programs. Follow-up questions to the interview questions would also widen the researcher's understanding of the participants' backgrounds and attitudes about healthy eating.

Implications

The garden club programs analyzed through this study were voluntary, after-school programs within one school district. Implications from findings of this study could include the notion that the children participating in these after-school garden club programs are children who

are already aware of healthy eating, gardening, and nutritional knowledge. Students not participating in these programs may be the students that need exposure to garden-based education and nutritional information that they are not receiving at home. Garden-based education has been shown to improve health-related attitudes and behaviors (Graham, Beall, Lussier, McLaughlin, & Zidenberg-Cherr, 2005; Graham & Zidenberg-Cherr, 2005; Hughes, 2003; Morris & Zidenberg-Cherr, 2002), but the students who need exposure to it the most should be sought after and targeted either by after-school programs or within school-day curriculum.

Summary

The purpose of this study was to determine if three elementary school garden club programs influenced students' attitudes and behaviors regarding fruit and vegetable consumption. The overall non-significant differences found before and after the garden club intervention programs could lead researchers to further analyze effective factors of garden-based education. Researchers, educators, curriculum developers, and other professionals may be able to draw upon findings from this study to grow and develop garden-based education to become an effective mode of nutritional content delivery. This study may also provide insight to improve the garden club programs evaluated through this research. Information about these concepts may enhance the understanding of how to reach students with nutrition and health information who need it most. This, in turn, could possibly provide insight into how to help address the obesity problem facing children today. Eventually, findings from this study may add to the literature of creating a foundation for incorporating gardening and other outdoor activities into public school curriculum frameworks to teach core subjects as well as nutrition, life skills, and other elective content. Gardening is a skill that may provide lifelong benefits to young children, and school

gardening initiatives may benefit from a more solid foundation of evidence that such programs and activities make a difference in the health of today's youth.

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Appendix A: IRB Approval Notification

UNIVERSITY OF ARKANSAS

Office of Research Compliance
Institutional Review Board

March 5, 2013

MEMORANDUM

TO:	Maggie McGriff Michael Daugherty
FROM:	Ro Windwalker IRB Coordinator
RE:	New Protocol Approval
IRB Protocol #:	13-02-496
Protocol Title:	*Effect of an After-School Garden Club Program on Elementary Students*
Review Type:	☐ EXEMPT ☒ EXPEDITED ☐ FULL IRB
Approved Project Period:	Start Date: 03/05/2013 Expiration Date: 02/27/2014

Your protocol has been approved by the IRB. Protocols are approved for a maximum period of one year. If you wish to continue the project past the approved project period (see above), you must submit a request, using the form *Continuing Review for IRB Approved Projects*, prior to the expiration date. This form is available from the IRB Coordinator or on the Research Compliance website (http://vpred.uark.edu/210.php). As a courtesy, you will be sent a reminder two months in advance of that date. However, failure to receive a reminder does not negate your obligation to make the request in sufficient time for review and approval. Federal regulations prohibit retroactive approval of continuation. Failure to receive approval to continue the project prior to the expiration date will result in Termination of the protocol approval. The IRB Coordinator can give you guidance on submission times.

This protocol has been approved for 120 participants. If you wish to make *any* modifications in the approved protocol, including enrolling more than this number, you must seek approval *prior to* implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.

If you have questions or need any assistance from the IRB, please contact me at 210 Administration Building, 5-2208, or irb@uark.edu.

210 Administration Building • 1 University of Arkansas • Fayetteville, AR 72701
Voice (479) 575-2208 • Fax (479) 575-3846 • Email irb@uark.edu

Appendix B: Letter to Parents – Garden Club

Spring 2013

Dear Parent,

I am a doctoral student at the University of Arkansas pursuing a degree in Curriculum & Instruction and I wish to conduct a research study at your child's school. I am interested in evaluating the effectiveness of the after-school garden club program in which your child participates. At the beginning and the end of this program, I would like to survey your child about his or her preferences and consumption of fruits and vegetables pertaining to the garden club. I will also choose several students at random to be interviewed briefly about their participation in the garden club program and beliefs about healthy eating.

Please consider allowing your child to participate in this study. There is no risk associated with participating, and valuable information will be obtained about the effectiveness of the after-school garden club program.

Thank you for your time and consideration with this study. If you consent for your child to participate in this study, please sign the attached form and send it back to the school with your child.

Feel free to contact me with questions or concerns.

Sincerely,

Maggie McGriff
mmcgrif@uark.edu

Appendix C: Letter to Parents – School Kids Connection

Spring 2013

Dear Parent,

I am a doctoral student at the University of Arkansas pursuing a degree in Curriculum & Instruction and I wish to conduct a research study at your child's school. I am interested in measuring knowledge, attitudes, and behaviors regarding consumption of fruits and vegetables in elementary children.

I would like to ask your permission to allow your child to participate by taking a pretest and posttest at the beginning and end of 10 weeks during the spring 2013 semester.
The questionnaire is attached to this email, so you will know exactly what your child will be asked. The group pre- and post-scores will be compared, as well as the children from the SKC program's scores will be compared to scores from children participating in other after-school programs.

Children will be assigned a participation number so their surveys will be kept anonymous. All responses and other information will be confidential. Please consider allowing your child to participate in this study. There is no perceived risk associated with participating.

Thank you for your time and consideration with this study. If you consent for your child to participate in this study, **please sign the attached form and send it back to school main office with your child by Thursday, March 28th.**

Feel free to contact me with questions.

Sincerely,

Maggie McGriff
mmcgrif@uark.edu

Appendix D: Garden Club Child Assent Form

University of Arkansas
CHILD ASSENT TO PARTICIPATE IN RESEARCH

This form is recommended for minors ages 7-12, but may be used for subjects up to age 17.

Effect of an After-School Garden Club Program on Elementary Students

My name is Maggie McGriff.

We are asking you to take part in a research study because we want to learn more about how this garden club program helps kids make healthy decisions, and how to make the program better in the future.

If you agree to be in this study, we will ask you to fill out a survey before and after the garden club program. Survey questions will not cause discomfort or pose any risk to you. The surveys should take no more than 10-20 minutes each to complete.

You may not directly benefit from this research study, but gathered information could help make the garden club program better for future kids in garden club.

Please talk this over with your parents before you decide whether or not to participate. We will also ask your parents to give their permission for you to take part in this study. But even if your parents say "yes," if you don't want to be in this study, you don't have to participate. Remember, being in this study is up to you and no one will be upset if you don't want to do this. If you do participate and later change your mind, you can stop participating at any time. Nobody will be angry or upset with you.

You can ask any questions that you have about the study. If you have a question later that you didn't think of now, you can call me at [redacted]

Signing your name below means that you agree to be in this study. You and your parents will get a copy of this form.

NAME OF STUDY PARTICIPANT

Printed Name of Participant	Signature of Participant	Date

SIGNATURE OF PERSON OBTAINING ASSENT

In my judgment the participant is voluntarily and knowingly agreeing to participate in this research study.

Maggie McGriff	[redacted]
Name of Person Obtaining Assent	Contact Phone Number
Signature of Person Obtaining Assent	Date

Appendix E: Garden Club Parental Consent Form

Effect of an After-School Garden Club Program on Elementary Students

Consent for a Minor to Participate in a Research Study
Principal Researcher: Maggie McGriff
Faculty Advisor: Dr. Michael Daugherty

This is a parental permission form for research participation. It contains important information about this study and what to expect if you permit your child to participate. **Your child's participation is voluntary.** Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to permit your child to participate. If you permit your child to participate, you will be asked to sign this form and will receive a copy of the form. We must also have your child's assent to participate in this study.

INVITATION TO PARTICIPATE
Your child is being invited to participate in a research study about the Apple Seeds Inc. after-school garden club program. Your child is being asked to participate in this study because we are evaluating the effectiveness of the program in regard to students' consumption of fruits and vegetables and other nutritional knowledge, attitudes, and behavior.

WHAT YOU SHOULD KNOW ABOUT THE RESEARCH STUDY

Who is the Principal Researcher?
Maggie McGriff
mmcgrif@uark.edu
[redacted]
Graduate Student, Curriculum & Instruction
Peabody Hall

Who is the Faculty Advisor?
Dr. Michael Daugherty
mkd03@uark.edu
[redacted]
Professor of Technology Education
Department Chair, Curriculum & Instruction
Peabody Hall 216

What is the purpose of this research study?
The purpose of this research is to determine knowledge, attitudes, and behaviors of elementary students regarding fruits and vegetables, garden club activities, and healthy behaviors.

Who will participate in this study?

Approximately 120 elementary students in grades 3-5 who participate in after-school programs at three different schools within the Fayetteville Public School District.

What will your child be asked to do?
Your child's participation will require the following: Respond to survey questions two times during the course of the program. The surveys should take no more than 10-20 minutes to complete. The survey sample is attached. Approximately 10 students will be chosen at random to participate in a recorded interview conducted by the researcher. Sample interview questions are attached. All participants' involvement will remain confidential and surveys and interview recordings will be destroyed upon data analysis.

What are the possible risks or discomforts?
There are no anticipated risks to participating in this study.

What are the possible benefits to your child if he/she participates in this study?
There may be no direct benefits to the participant unless he/she participates in the garden club program in subsequent years after the study takes place. Apple Seeds, Inc. and Fayetteville Public Schools will benefit from this data to be able to improve the garden club programs for elementary students. Nutritional information will be obtained and analyzed to enhance our understanding of how garden activities may influence child nutrition behaviors and provide possible implications for addressing health risks in children.

How long will the study last?
Participation time required will be minimal. Students will be asked to complete two surveys (at the beginning and end of the program) over the course of 10 weeks that should last no more than 10-20 minutes each. Surveys will be administered during the after-school garden club time. Interviews conducted should take no longer than 10 minutes and will be conducted once.

Will your child receive compensation for time and inconvenience if you choose to allow him/her to participate in this study?
No.

Will you or your child have to pay for anything?
No, there will be no cost associated with your participation.

What are the options if I do not want my child to be in the study?
We would greatly appreciate your child's participation, but if you do not want your child to be in this study, you may refuse to allow him/her to participate. Your child may refuse to participate even if you give permission. If your child decides to participate and then changes his/her mind, your child may quit participating at any time. Your child will not be punished or discriminated against in any way if you refuse to allow participation or if your child chooses not to participate.

How will my child's confidentiality be protected?
All information will be kept confidential to the extent allowed by applicable State and Federal law and University policy. Students will not put their names on the surveys, so data cannot be

traced back to any one individual. Surveys and interview recordings will be destroyed at the completion of data collection and analysis. Interview transcriptions will be kept in a locked file cabinet and used only for data analysis and further research.

Will my child and/or I know the results of the study?
At the conclusion of the study you will have the right to request feedback about the results. You may contact the Principal Researcher, Maggie McGriff if you wish to see any results or would like feedback about the study. You will receive a copy of this form for your files.

What do I do if I have questions about the research study?
You have the right to contact the Principal Researcher or Faculty Advisor as listed below for any concerns that you may have. Researcher information is listed above.

You may also contact the University of Arkansas Research Compliance office listed below if you have questions about your rights as a participant, or to discuss any concerns about, or problems with the research.

Ro Windwalker, CIP
Institutional Review Board Coordinator
Research Compliance
University of Arkansas
120 Ozark Hall
Fayetteville, AR 72701-1201
479-575-2208
irb@uark.edu

I have read the above statement and have been able to ask questions and express concerns, which have been satisfactorily responded to by the investigator. I understand the purpose of the study as well as the potential benefits and risks that are involved. I understand that participation is voluntary. I understand that significant new findings developed during this research will be shared with me and, as appropriate, my child. I understand that no rights have been waived by signing the consent form. I have been given a copy of the consent form.

Print name: _____

Sign name: _____
Date:_____

Appendix F: School Kids Connection Child Assent Form

University of Arkansas
CHILD ASSENT TO PARTICIPATE IN RESEARCH

This form is recommended for minors ages 7-12, but may be used for subjects up to age 17.

Effect of an After-School Garden Club Program on Elementary Students

My name is Maggie McGriff.

We are asking you to take part in a research study because we want to learn more about how after school programs help kids make healthy decisions, and how to make programs better in the future.

If you agree to be in this study, we will ask you to fill out a survey two times during the SKC afterschool program. Survey questions will not cause discomfort or pose any risk to you. The surveys should take no more than 10-20 minutes each to complete.

You may not directly benefit from this research study, but gathered information could help make after school programs better in the future.

Please talk this over with your parents before you decide whether or not to participate. We will also ask your parents to give their permission for you to take part in this study. But even if your parents say "yes," if you don't want to be in this study, you don't have to participate. Remember, being in this study is up to you and no one will be upset if you don't want to do this. If you do participate and later change your mind, you can stop participating at any time. Nobody will be angry or upset with you.

You can ask any questions that you have about the study. If you have a question later that you didn't think of now, you can call me at [redacted]

Signing your name below means that you agree to be in this study. You and your parents will get a copy of this form.

NAME OF STUDY PARTICIPANT

Printed Name of Participant	Signature of Participant	Date

SIGNATURE OF PERSON OBTAINING ASSENT

In my judgment the participant is voluntarily and knowingly agreeing to participate in this research study.

Maggie McGriff	[redacted]
Name of Person Obtaining Assent	Contact Phone Number
Signature of Person Obtaining Assent	Date

Appendix G: School Kids Connection Parental Consent Form

Effect of an After-School Garden Club Program on Elementary Students

Consent for a Minor to Participate in a Research Study
Principal Researcher: Maggie McGriff
Faculty Advisor: Dr. Michael Daugherty

This is a parental permission form for research participation. It contains important information about this study and what to expect if you permit your child to participate. **Your child's participation is voluntary.** Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to permit your child to participate. If you permit your child to participate, you will be asked to sign this form and will receive a copy of the form. We must also have your child's assent to participate in this study.

INVITATION TO PARTICIPATE
Your child is being asked to participate in this study because we are comparing the differences in the groups' consumption of fruits and vegetables between the garden club program and the SKC after-school program.

WHAT YOU SHOULD KNOW ABOUT THE RESEARCH STUDY

Who is the Principal Researcher?
Maggie McGriff
mmcgrif@uark.edu
[redacted]
Graduate Student, Curriculum & Instruction
Peabody Hall

Who is the Faculty Advisor?
Dr. Michael Daugherty
mkd03@uark.edu
[redacted]
Professor of Technology Education
Department Chair, Curriculum & Instruction
Peabody Hall 216

What is the purpose of this research study?
The purpose of this research is to determine knowledge, attitudes, and behaviors of elementary students regarding fruits and vegetables.

Who will participate in this study?
Approximately 120 elementary students in grades 3-5 who participate in after-school programs within the Fayetteville Public School District.

What will your child be asked to do?
Your child's participation will require the following: Respond to survey questions two times during the course of the program. The surveys should take no more than 10-20 minutes to complete. The survey sample is attached. All participants' involvement will remain confidential and surveys and interview recordings will be destroyed upon data analysis.

What are the possible risks or discomforts?
There are no anticipated risks to participating in this study.

What are the possible benefits to your child if he/she participates in this study?
There may be no direct benefits to the participant unless he/she participates in the garden club program in subsequent years after the study takes place. Apple Seeds, Inc. and Fayetteville Public Schools will benefit from this data to be able to improve the after-school programs for elementary students. Nutritional information will be obtained and analyzed to enhance our understanding of child nutrition and provide possible implications for addressing health risks in children.

How long will the study last?
Participation time required will be minimal. Students will be asked to complete two surveys over the course of 10 weeks that should last no more than 10-20 minutes each. Surveys will be administered during the after-school club time.

Will your child receive compensation for time and inconvenience if you choose to allow him/her to participate in this study?
No.

Will you or your child have to pay for anything?
No, there will be no cost associated with your participation.

What are the options if I do not want my child to be in the study?
We would greatly appreciate your child's participation, but if you do not want your child to be in this study, you may refuse to allow him/her to participate. Your child may refuse to participate even if you give permission. If your child decides to participate and then changes his/her mind, your child may quit participating at any time. Your child will not be punished or discriminated against in any way if you refuse to allow participation or if your child chooses not to participate.

How will my child's confidentiality be protected?
All information will be kept confidential to the extent allowed by applicable State and Federal law and University policy. Students will not put their names on the surveys, so data cannot be traced back to any one individual. Surveys will be destroyed at the completion of data collection and analysis. Interview transcriptions will be kept in a locked file cabinet and used only for data analysis and further research.

Will my child and/or I know the results of the study?

At the conclusion of the study you will have the right to request feedback about the results. You may contact the Principal Researcher, Maggie McGriff if you wish to see any results or would like feedback about the study. You will receive a copy of this form for your files.

What do I do if I have questions about the research study?
You have the right to contact the Principal Researcher or Faculty Advisor as listed below for any concerns that you may have. Researcher information is listed above.

You may also contact the University of Arkansas Research Compliance office listed below if you have questions about your rights as a participant, or to discuss any concerns about, or problems with the research.

Ro Windwalker, CIP
Institutional Review Board Coordinator
Research Compliance
University of Arkansas
120 Ozark Hall
Fayetteville, AR 72701-1201
479-575-2208
irb@uark.edu

I have read the above statement and have been able to ask questions and express concerns, which have been satisfactorily responded to by the investigator. I understand the purpose of the study as well as the potential benefits and risks that are involved. I understand that participation is voluntary. I understand that significant new findings developed during this research will be shared with me and, as appropriate, my child. I understand that no rights have been waived by signing the consent form. I have been given a copy of the consent form.

Print name: _____

Sign name: _____
Date:_____

Appendix H: Approval Letter

APPLE SEEDS, INC.

February 1, 2013

To Whom It May Concern:

Apple Seeds, Inc. formally grants Maggie McGriff and her faculty advisor(s) the right to conduct research within our Apple Seeds, Inc. after-school garden club program at local elementary schools for the purpose of dissertation research. We understand that students will be asked to participate in a survey and semi-structured interviews for this study, and also are aware that observations by the researcher(s) will take place to collect data as well.

Apple Seeds, Inc. gives permission for data of this nature to be collected for the duration of the garden club program, and that contact with the participants will begin no sooner than February 2013 and will end no later than February 2014. However, if further data collection is needed, we will be open to allowing further research with our program upon notification and at our discretion. We understand that the information and data collected for this study will be made available to us for program improvement efforts.

Sincerely,

[redacted]

Appendix I: Approval Letter

BOYS & GIRLS CLUB
OF FAYETTEVILLE

February 1, 2013

To Whom It May Concern:

The Boys and Girls Club formally grants Maggie McGriff and her faculty advisor(s) the right to conduct research within the School Kids Connection afterschool program for the purpose of dissertation research. We understand that students will be asked to participate in a survey and will take a 10-20 minute questionnaire twice over the course of a 10-week period.

The Boys and Girls Club gives permission for data of this nature to be collected for the duration of the garden club program, and that contact with the participants will begin no sooner than February 2013 and will end no later than February 2014. However, if further data collection is needed, we will be open to allowing further research with our program upon notification and at our discretion. We understand that the information and data collected for this study will be made available to us for program improvement efforts.

Sincerely,

[redacted]

GREAT FUTURES START HERE.

Donald W. Reynolds Boys & Girls Club of Fayetteville
550 North Ripple Road • Fayetteville, AR 72704 • Tel 479-442-9242 • Fax 479-442-5192
www.fayettevilleklds.org

Making a difference in the lives of our youth and families...

Appendix J: Approval Letter

Butterfield Trail Elementary School

"Blazing trails to the future by asking, sharing, and working together!"

[redacted]

February 1, 2013

To Whom It May Concern:

Butterfield Trail Elementary School formally grants Maggie McGriff and her faculty advisor(s) the right to conduct research within our school's garden club program for the purpose of dissertation research. We understand that students will be asked to participate in a survey and semi-structured interviews for this study, and also are aware that observations by the researcher(s) will take place to collect data as well.

Butterfield Trail Elementary School gives permission for data of this nature to be collected for the duration of the garden club program, and that contact with the participants will begin no sooner than February 2013 and will end no later than February 2014. However, if further data collection is needed, we will be open to allowing further research with our program upon notification and at our discretion. We understand that the information and data collected for this study will be made available to us for program improvement efforts.

Sincerely,

[redacted]

Appendix K: Approval Letter

[redacted]

February 1, 2013

To Whom It May Concern:

Leverett Elementary School formally grants Maggie McGriff and her faculty advisor(s) the right to conduct research within our school's garden club program for the purpose of dissertation research. We understand that students will be asked to participate in a survey and semi-structured interviews for this study, and also are aware that observations by the researcher(s) will take place to collect data as well.

Leverett Elementary School gives permission for data of this nature to be collected for the duration of the garden club program, and that contact with the participants will begin no sooner than February 2013 and will end no later than February 2014. However, if further data collection is needed, we will be open to allowing further research with our program upon notification and at our discretion. We understand that the information and data collected for this study will be made available to us for program improvement efforts.

Sincerely,

[redacted]

Appendix L: Approval Letter

[redacted]

[redacted]

February 1, 2013

To Whom It May Concern:

Root Elementary School formally grants Maggie McGriff and her faculty advisor(s) the right to conduct research within our school's garden club program for the purpose of dissertation research. We understand that students will be asked to participate in a survey and semi-structured interviews for this study, and also are aware that observations by the researcher(s) will take place to collect data as well.

Root Elementary School gives permission for data of this nature to be collected for the duration of the garden club program, and that contact with the participants will begin no sooner than February 2013 and will end no later than February 2014. However, if further data collection is needed, we will be open to allowing further research with our program upon notification and at our discretion. We understand that the information and data collected for this study will be made available to us for program improvement efforts.

Sincerely [redacted]

Appendix M: Fruit and Vegetable Neophobia Questionnaire Approval Letter

November 29, 2012

Hi Maggie,

Thanks for your interest in the neophobia tool, and you are absolutely welcome to use the tool! We have a paper on the internal validity of the instrument that was recently accepted by Appetite and can be viewed here.

FoodCorps has also been using that tool to evaluate their members' programs for the same outcomes, and a few other researchers around the country have been using it. We would appreciate any feedback (critical and positive) you have regarding use of the tool when you are finished with your study. Please let me know if you have specific questions about the tool, and we can also schedule a time to talk about the tool if that would be helpful.

Best,
Amy

Appendix N: Fruit and Vegetable Neophobia Questionnaire

Fruits and Vegetables:

What do you think about them?

Please circle your answers.

What grade are you in?	K	1	2	3	4	5
What is your gender?			Boy			Girl

1.	How much do you like fruit?	A lot	A little	Not very much	Not at all
2.	How much do you like fruits that you have never tried before?	A lot	A little	Not very much	Not at all
3.	How much do you like tasting new fruits?	A lot	A little	Not very much	Not at all
4.	Will you taste a fruit if you don't know what it is?	Definitely	Probably	Probably not	Definitely not
5.	Will you taste a fruit if it looks strange?	Definitely	Probably	Probably not	Definitely not
6.	Will you taste a fruit if you have never tasted it before?	Definitely	Probably	Probably not	Definitely not
7.	When you are at a friend's house, will you try a new fruit?	Definitely	Probably	Probably not	Definitely not
8.	When you are at school, will you try a new fruit?	Definitely	Probably	Probably not	Definitely not

9.	When you are at home, will you try a new fruit?	Definitely	Probably	Probably not	Definitely not
10.	How many times have you tried a new fruit since school started this year?	Never	1	2	3 or more
11.	How much do you like vegetables?	A lot	A little	Not very much	Not at all
12.	How much do you like vegetables that you have never tried before?	A lot	A little	Not very much	Not at all
13.	How much do you like tasting new vegetables?	A lot	A little	Not very much	Not at all
14.	Will you taste a vegetable if you don't know what it is?	Definitely	Probably	Probably not	Definitely not
15.	Will you taste vegetables if it looks strange?	Definitely	Probably	Probably not	Definitely not
16.	Will you taste a vegetable if you have never tasted it before?	Definitely	Probably	Probably not	Definitely not
17.	When you are at a friend's house, will you try a new vegetable?	Definitely	Probably	Probably not	Definitely not
18.	When you are at school, will you try a new vegetable?	Definitely	Probably	Probably not	Definitely not
19.	When you are at home, will you try a new vegetable?	Definitely	Probably	Probably not	Definitely not

20.	How many times have you tried a new vegetable since school started this year?	Never	1	2	3 or more

You are done! Thank you for completing this questionnaire. ☺

Appendix O: Garden Club Curriculum Outline

Apple Seeds, Inc. Gardening Club
Fall Semester Outline

Week 1
Main Idea: Students will be introduced to Garden Club leaders, expectations, and the garden.

1. Snack and introductions
2. Pre-evaluations
3. Expectations of Garden Club
4. Garden tour
5. Water garden
6. Clean-up

Week 2
Main Idea: Students will categorize vegetables into root, leaves and fruit and identify where they grow best.

1. Snack and Recap of Garden Club Expectations
2. Overview of main goals for today's Garden Club
3. Where Do Plants Grow Best?
4. Plant radishes in garden. Plant 1/4 in. deep using pinky finger to make hole. Space 2 in. apart. Water well.
5. Water garden
6. Clean-up

Week 3
Main Idea: Students will harvest kale & make Kale Chips.

1. Snack and Garden Club Expectations
2. Overview of main goals for today's Garden Club
3. Harvest Kale
4. Bake Kale Chips and Recipe Handout
5. Water garden

6. Clean-up

Week 4
Main Idea: Students will plant salad greens and create garden signs.

1. Snack and Garden Club Expectations
2. Overview of main goals for today's Garden Club
3. Plant Salad Greens. Clear soil and flatten with tools. Sprinkle seeds onto soil. Sprinkle soil on top of seeds and water well.
4. Create Garden Quote Signs
5. Water garden
6. Clean-up

Week 5
Main Idea: Students will learn about their School Garden Market and create fliers

1. Snack and Garden Club Expectations
2. Overview of main goals for today's Garden Club
3. Flier Competition for School Garden Market
4. Water garden
5. Clean-up

Week 6
Main Idea: Students will build low tunnels on garden beds

1. Snack and Garden Club Expectations
2. Overview of main goals for today's Garden Club
3. Build Low Tunnels
4. Water garden
5. Clean-up

Week 7
Main Idea: Students will prepare the soil and plant garlic bulbs and daffodil bulbs.

1. Snack and Garden Club Expectations
2. Overview of main goals for today's Garden Club
3. What is Garlic and How is it Planted?
4. Plant Garlic Bulbs and Daffodil Bulbs
5. Water garden
6. Clean - up

Week 8
Main Idea: Students will create School Garden Crafts for School Garden Market. Students will also create Thank you Cards for leaders and school.

1. Snack and Garden Club Expectations
2. Overview of main goals for today's Garden Club
3. Sage Bundle Craft
4. School Garden Rock Magnets
5. Thank You Cards
6. Water garden
7. Clean-up

Week 9
Main Idea: Students will host their School Garden Market during Garden Club.

1. Check out of School 20 minutes early
2. Snack and School Garden Market Expectations
3. Overview of School Garden Market Rules and Roles
4. School Garden Market
5.

Week 10
Main Idea: Students will complete their post evaluations and have a Garden Club party with parents!

1. Post evaluations
2. Garden Harvest and Prep
3. Potluck!
4. Water Garden
5. Recipes and more info about Apple Seeds

Rainy Weather Ideas:
1. Plant Identification Stone Markers
2. Garden Signs
3. Garden Art

Red Text = Activity Included in Gardening Club Tool Kit

APPLE SEEDS, INC.
"PLANTING THE SEEDS OF HEALTH IN NW ARKANSAS"

Apple Seeds, Inc. Gardening Club
Spring Semester Outline

Week 1
Main Idea: Students will be introduced to Garden Club leaders, expectations, and the garden.

7. Snack and introductions
8. Pre-evaluations
9. Expectations of Garden Club
10. Nature Journals
11. Garden tour
12. Water garden
13. Clean-up

Week 2
Main Idea: Students will choose their favorite vegetables and plan the garden.

7. Snack and Recap of Garden Club Expectations
8. Overview of main goals for today's Garden Club
9. List of favorite vegetables
10. Garden Planning Activity
11. Plant radishes in designated garden area (based on student's plan). Plant 1/4 in. deep using pinky finger to make hole. Space 2 in. apart. Water well.
12. Water garden
13. Clean-up

Week 3
Main Idea: Students will learn to build a garden trellis and plant sugar snap peas.

7. Snack and Garden Club Expectations
8. Overview of main goals for today's Garden Club
9. Bamboo Trellis Activity for sugar snap peas
10. Plant sugar snap peas. Plant seeds around bamboo stalk (4 seeds per stalk) 1/2 in. deep. Water well.
11. Water garden

12. Clean-up

Week 4
Main Idea: Students will learn about healthy soil and composting.

7. Snack and Garden Club Expectations
8. Overview of main goals for today's Garden Club
9. Learn about Compost and Importance of Healthy Soils Activity
10. Create Compost Sign
11. Water garden
12. Clean-up

Week 5
Main Idea: Students will learn to transplant summer seedlings in the school garden.

6. Snack and Garden Club Expectations
7. Overview of main goals for today's Garden Club
8. Transplanting Seedlings Activity
9. Water garden
10. Clean-up

Week 6
Main Idea: Students will build a cucumber trellis and plant cucumber seeds.

1. Snack and Garden Club Expectations
2. Overview of main goals for today's Garden Club
3. Garden Trellis Activity
4. Plant cucumber seeds 1/4 in. deep and 3 in. apart. Water well.
5. Water garden
6. Clean-up

Week 7
Main Idea: Students will learn to harvest vegetables from the garden and prepare them for a salad.

7. Snack and Garden Club Expectations
8. Overview of main goals for today's Garden Club
9. Harvesting Activity
10. Prepare Salad and Healthy Salad Dressing
11. Water garden
12. Clean - up

Week 8
Main Idea: Students will make garden stones as art for the garden.

8. Snack and Garden Club Expectations
9. Overview of main goals for today's Garden Club
10. Garden Stone Activity
11. Water garden
12. Clean-up

Week 9
Main Idea: Students will learn how to plant zucchini and yellow squash seeds. Students will also draw thank you cards for volunteers and their school leaders.

6. Snack and Garden Club Expectations
7. Overview of main goals for today's Garden Club
8. Planting Zucchini and Yellow Squash Seeds Activity
9. Garden Club Thank you Cards Activity
10. Water garden and Clean-up

Week 10
Main Idea: Students will complete their post evaluations and have a Garden Club party with parents!

6. Post evaluations
7. Garden Harvest and Prep
8. Potluck!
9. Water Garden
10. Recipes and more info about Apple Seeds

Rainy Weather Ideas:
4. Plant Identification Stone Markers
5. Garden Signs
6. Garden Art

Red Text = Activity Included in Gardening Club Tool Kit