

**Student Gardeners: Perceived Benefits of Community Gardening With Elementary School**

**Students**

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### **Abstract**

Past research has explored the benefits of community and school gardens. The present study was conducted to add to this literature by investigating the possible impact of a school gardening project, paired with a nutrition program, on elementary students' behaviors in the classroom and psychological sense of belonging and connectedness towards their school environment. Seventeen 4<sup>th</sup> grade students maintained a school garden, participated in lessons around food nutrition, and sampled fruits and vegetables (intervention group). Thirteen 3<sup>rd</sup> grade students served as the control group. Classroom behavior of students in the intervention and control groups was assessed pre- and post-intervention with teachers reporting individual student behavior with the Social, Academic, & Emotional Risk Screener and observation of classroom behavior by researchers with the Direct Behavior Rating Scale. The intervention consisted of gardening and nutrition lessons occurring 10 times over 16 weeks. Students in the intervention group reported their emotions at the conclusion of each gardening and nutrition lesson. Focus group interviews were conducted with students in the intervention group at the end of the intervention. Results of the focus groups indicated that students learned about food, gardening, and healthy eating. Students expressed feelings of happiness and developing social connections with others. Classroom behavior as noted by teachers and researcher observations were not impacted by the intervention. These findings suggest value in developing and maintaining school gardens.

## **Student Gardeners: Perceived Benefits of Community Gardening with Elementary School**

### **Students**

*“I feel like it [the garden] inspired more of me- more of me.”* (Fourth grade participant)

A combination of earth, water, sun, nutrients, and seeds make up the basic structure of a garden to flourish fruits, vegetables, flowers and other non-edible plants (Blair, 2009). Gardens are tended by individuals, families, neighbors, community members, and students of all ages. These garden structures that sustain human life are not only the foundation for our ecosystem, but also opportunities that encourage sense of community, create positive relationships, and establish meaningful connections with food and our bodies (Burt et al., 2018).

The study of these relationships that impact the community members comes from the Community Psychology perspective. Community psychology focuses on evaluating all direct and indirect influential factors in a person’s community that encourage or prohibit them from leading a healthy, successful, valuable, or beneficial life (Kloos et al., 2012). This perspective has relevance for suggesting possible impacts of gardens in the lives of community members. Schools are communities of student, families, teachers, and administrators. As such, school gardens could be expected to provide similar opportunities to the members of these communities.

The present study explored the possible impact of a school gardening project, paired with a nutrition program, on elementary students’ behaviors in the classroom. Possible impact of the interventions on elementary students’ psychological sense of belonging and connectedness towards their school environment was also explored. This study approached these purposes with a community psychology lens.

### **The Role of Community Psychology**

Community psychology embraces an ecological perspective. From an ecological standpoint, there are many factors that can benefit users of community gardens. Specifically, Nelson and

Prilleltensky (2010) described the “rippling ecological effects” that different and expanding systems have on an individual. They emphasize the importance personal, relational, and communal wellbeing have on the individual level, as well as at local and global levels. In regard to school gardening activities, community psychology pedagogy can explore student to student relationships, student to teacher relationships, student to family member relationships, and relationships between the student to members in the community who provided resources and education to the program. It is important to understand influences local policies can have on gardening programs and the efficiency of the gardens. Culturally, what does the community think of gardening programs in schools? These factors showcase the diverse roles that actively affect the outcome for individuals living in their communities.

Community psychology is an important perspective to consider with school gardens as it takes multiple parties and resources in the school (e.g., funding, personnel, time, etc.) to sustain a garden (Ozer, 2007; Twiss et al., 2003). School gardens provide children with important responsibilities (i.e., growing food, planting, watering, and weeding). Teachers in California noted student reactions and enthusiasm, stressing that gardens are “... living laboratory where lessons are drawn from real-life experiences rather than textbook examples, allowing students to become active participants in the learning process” (Pounders, 2006, p. 6).

### **Community Gardens**

Ohmer et al. (2009) suggests the defining quality of a community garden is the cultivation of food and or floral growth in a designated urban area that produces benefits for both individuals and communities. A meta-analysis conducted by Draper and Freedman (2010), found one third of the studies were conducted with youth and adolescent populations. They specify the importance of a community garden with an emphasis on the term, “community”. In this sense, community means groups of people (nonspecific) gathering in different areas (neighborhoods, hospitals, prisons, etc.),

working together to build and sustain a garden. Gardens have been known to go beyond the surface level of feeding humans by encouraging relationships between people, providing opportunities for education, treating and preventing physical and emotional ailments, and even changing ecological relationships within a community (Egli et al., 2016; Ozer, 2007; Pounders, 2006; & Van den Berg & Custers, 2011).

Another benefit to community gardens, is allowing access to healthy foods for families living in 'food deserts'. A food desert is refers to residents living with low income and low access to healthy food (e.g., a grocery store is more than 10 miles away for rural communities). According to Ver Ploeg et al. (2011), living in food deserts may be a factor leading to food related illnesses such as obesity and related conditions such as diabetes. Community gardens have the potential to alleviate food pressures when access is limited and unaffordable.

Similarly, community gardens can be used by individuals across diverse ages, races, socioeconomic status, cultures, and individuals with various abilities (Draper & Freedman, 2010). A study conducted in South Korea, with first through third grade students with varying intellectual disabilities, saw an increase in positive social behaviors for the members of the garden art therapy program (Kim et al., 2012). Gerber et al. (2017) recognized community gardens as a resource to citizens of India seeking sanctuary in the United States. In the case of Nepali Bhutanese refugees who were forced out of their country and found sanctuary in the United States, community gardens were a way for Nepali communities to feed themselves and encourage psychological wellbeing during this stressful and traumatic event.

Community gardens have a variety of purposes, goals, and functions. In Winnipeg, Canada, Fulford and Thompson (2013) found community gardens were beneficial in preventing at-risk youth from joining gangs or participating in gang-related activities. This age group ranged from 9 to 18 year old participants. The researchers attributed this to improved self-esteem, as well as development

and education around food resources and environmental awareness. Results also revealed that gardens helped connect involved youth to other social networks that might guide them through personal life struggles.

Historically, neighborhoods lacking sufficient economic, social, environmental, and cultural resources used community gardens as spaces to meet and discuss the needs of their local community (Ohmer et al., 2009). This historical standpoint continues with the California Healthy Cities and Communities initiative. This health initiative is aimed at addressing barriers around public health issues such as program development, implementation, evaluation, and policies impacting public health services. Community gardens became an outcome for health advocacy (Twiss et al., 2003). Specifically, Twiss and colleagues reported that West Hollywood paired a nutrition curriculum and a physical education plan with their school garden and saw a 6% increase of physical activity and a 10% increase in fruit and vegetable intake. Similarly, San Bernardino experienced a 20% increase in at-home garden participation after school garden activities were implemented.

There has been continued interest in possible benefits of community gardens. Soga et al. (2017) completed a meta-analysis of possible psychological benefits of horticulture practices, including community gardens, aimed at impacting physical and mental wellbeing (e.g., dementia, depression, and intellectual and physical disabilities) with participant average ages ranging from 8.5-84.7 years old. After reviewing 22 garden-based interventions around the globe, the researchers concluded that community gardens could be beneficial in preventing a multitude of physical and psychological ailments, thereby increasing participants' health and wellbeing. Among the health benefits noted, researchers reported an increase in cognitive function, physical activity levels, and overall general health, as well as a reduction in mood disturbances, stress, depression, and anxiety symptomology. Additionally, Soga and colleagues concluded that with increased health and wellbeing, there could be savings of financial resources used to treat people with health issues.

## **School Gardens Grades K-8**

Schools around the U.S. are utilizing gardens for educational and recreational purposes for students in grades K-8 (Pounders, 2006; Ozer, 2007). Pounders (2006) expressed that school gardens incorporate a hands-on learning technique as a universal teaching strategy to enhance traditional, standard teaching styles and environments. Moreover, the garden is an opportunity to activate diverse methods of learning (i.e., observational, hands-on discovery, experimental, nurturing, and educational). During the growth process of children, a community garden adds an element of camaraderie by establishing public designated spaces for the cultivation of vegetation (Pounders, 2006; Ozer, 2007; Egli et al., 2016). This benefits individuals and communities by providing local food sources, building relationships, and establishing leisure and pleasurable, natural spaces (Egli et al., 2016; Pounders, 2006).

### ***Benefits of School Gardening***

Emekauwa (2004) explored 4th and 8th grade students in a place-based learning program in schools as a way to increase student learning in a variety of school subjects such as: language arts, mathematics, social studies and sciences. East Feliciana Parish public school in Louisiana was at risk of losing its resources due to consistently low academic performances and a continuous changeover of management. After two years of implementing the program, English Language Arts unsatisfactory scores within 1,800 students decreased from 27.3% to 18.4%. This ground-breaking work has been expanded to other schools and additional benefits have been examined.

**Psychological impacts of students.** Studies also show the psychological impacts of community gardening by increasing participants' sense of belonging among others. In Winnipeg, Canada, a study conducted with a Boys and Girls Club created an intervention, Youth for EcoAction, which showed a unanimous increase in self-esteem. Results of interviews with interns and staff indicated that sense of pride and accomplishment, as well as pride in community increased

in members (Fulford & Thompson, 2013). The researchers focus was participants' community development and the effects of community gardening, but they also found an increase in skill building and job training, self-esteem and belonging, nutrition and food security, and environmental awareness and behavior. These were linked to a positive overall wellbeing. Similarly, Draper and Freedan (2010), conducted a review on multiple community gardening interventions including participants who were youth and adults, students and educators, families and households, garden participants and garden leaders. Both teams, Draper and Freedan (2010) and Fulford and Thompson (2013), found the benefits of community gardening positively impacting social relationships, health benefits associated with increased knowledge of fruit and vegetables, confidence in food security, educating the youth in healthier lifestyles, and crime prevention.

**Health differences for gardening participants.** A health difference in adolescents was found in a systemic review of a garden-based interventions used to increase fruit and vegetable intake of adolescent participants (Savoie-Roskos et al., 2016). Fourteen studies published between 2005 and 2015, conducted in multiple countries, studied gardening activities with participants ranging in age from 2 to 18 years old. Of the 14 studies, 10 found an increase in student fruit and vegetable consumption. The authors specify that the variable findings might be because some students may not have had access to fruits and vegetables at home, which may have influenced whether or not student consumption of fruits and vegetables increased.

**Benefits beyond the garden.** When gardens are used as teaching methods, multiple resources are needed to implement the activity such as expertise, knowledge, and support from others in the community (Bucher, 2017; Fulford, & Thompson, 2013; Hazzard et al., 2011; Litt et al., 2015). The support needed from different entities ends up bridging community members to schools that otherwise might not have been coupled.

This key role of bridging communities was an important element in the current study.

Researchers conducting the current experiment did not have the knowledge and resources to teach food nutrition or provide food samples for the study. However, collaboration with non-profit organizations, local farmers, grocery stores, and supportive schools provided these resources to conduct a more thorough study. Resources provided by outside businesses included educational strategies (i.e., the curriculum taught during the study), volunteers (nutrition students and interns to help teach the lessons), financial support (mileage reimbursement for travels), and supplemental provisions (food tastings for students during lessons and prizes for completing homework).

### ***Barriers to School Gardens***

There are challenges and barriers school gardens face while communicating with communities, as well as obstacles prohibiting a successful implementation process. Through extensive research with participating schools, Hazzard et al. (2011) identified four key obstacles that inhibit schools from providing students with a functioning garden. The identified obstacles were a lack of individuals to guide activities and education to the participants, lack of financial support, lack of materials to maintain the gardens health, and lack of instruction for gardeners to cultivate the garden. Ten schools in the state of California were awarded substantial funding for implementing and sustaining a school garden. A variety of professionals such as experts in child education, school gardens, environmental agencies, data collectors, and interviewers, were gathered to conduct interviews regarding successful garden implementation and maintenance, and analyzing the gardens ability to meet the California State content standards, as well as using the garden to teach other school subjects. Hazzard et al. (2011) and Fulford and Thompson (2013) have suggested that lack of funding and not having an associate to coordinate the garden can be a deficit, along with not having the cooperation of administration staff, more committed volunteers and more available teachers.

Another barrier in creating effective school gardens is the difficulty communicating the results and outcome the garden program to the participants and surrounding communities (Hazzard

et al., 2011). A review conducted by Savoie-Roskos et al. (2017), concluded that while students were introduced to healthier foods from the program at school, the studies did not measure if healthy eating was sustained outside of school. This points to the need for long-term studies, as well as a possible disconnect between students at school and their home life. Without this connection, longevity of a previously implemented program is an obstacle prohibiting its goal of long term success.

It is essential to consider barriers that make it difficult for school gardens to exist in order to determine how to support gardens. Research can determine where the challenges are occurring, as well as possible opportunities to ameliorate those obstacles. Increasingly valuable measures, tools, and data collection strategies are developing to evaluate the outcomes of school gardens from in class behaviors to changes within the students' communities and beyond.

### **The Present Study**

Past research (e.g., Egli et al., 2016; Emekauwa, 2004; Ozer, 2007, etc.) has demonstrated the potential benefits of a school garden. With the current study, we attempt to explore benefits using multiple measures in order to showcase the outcomes to students, teachers, and parents. With this information, we may be able to uncover specific elements of garden interventions that need attention, as well as highlight the programs that have the intended impacts on the garden participants.

### ***Research Questions***

The present study explored perceived benefits of a school garden paired with a nutrition curriculum and attempted to answer the following research questions. What is the impact of a school gardening intervention on elementary students' behaviors within the classroom? What is the impact of a school gardening intervention on elementary students' psychological sense of belonging and connectedness towards their school environment?

## **Method**

### **Participants**

This study was conducted in a low-income, predominantly Hispanic-serving elementary school in rural Northern California. While surrounded by orchards and agriculture, the student body and surrounding community resided in a food desert (Ver Ploeg et al., 2011). Fairview Elementary, the school where the study was conducted, is geographically located in the rural town of Orland, California, with students living throughout the surrounding area. The Center for Healthy Communities was our link to a school willing to participate in a school garden. Not only was the school willing to participate, but they were one of the only schools in the area who has not had a school garden program implemented on their campus. Other schools had previous experience with gardens, and/or, were not able to participate in the study. Students participating in the study consisted of 13 third graders (control group) and 17 fourth graders (experimental group).

### **Procedure**

The present study was possible because of collaboration between the researchers and other entities. The Center for Healthy Communities (CHC) was an influential partner in conducting this study as they were the bridge connecting student researchers to student gardeners. Melissa Stearns, the Health Education Specialist, was our gatekeeper to the superintendent of the Orland based school. During the initial steps of the study, she presented the research idea to the superintendent of the Orland school district who then granted permission and support for the project. Researchers obtained IRB approval.

With assistance from the Health Education Specialist, researchers connected with the school principal, who welcomed our gardening program. The principal introduced the team to elementary school teachers willing to participate in the gardening study. Seven teachers applied for the

gardening intervention and the chosen class was drawn from a hat. The second pick of the hat was the control group for the first semester with the promise of being the experimental group the second semester. Partnering with the CHC made this study possible by providing 1) researchers with the connection to the school, 2) a curriculum for the intervention along with wonderful teachers to educate students, and 3) some financial reimbursements to assist in the travels, food provisions, and gardening resources needed for the experiment. The team was influential in setting up the garden for the students, which aided in keeping the intervention a positive experience for its array of participants.

Once the intervention and control groups were established, teacher and parent consent forms in both English and Spanish were collected, as well as child assent forms. Students took parental consent forms home to give to parents. Children returned signed consent forms to their teachers. Students who did not have permission to participate were not part of data collection and were removed from video observation. However, they were able to participate in activities if they wanted. No students declined to participate in any aspect of the program.

Before the gardening activities were introduced to the intervention group of students, both teachers completed the Social, Academic, & Emotional Behavior Risk Screener questionnaires assessing students' classroom behavior. By this time in the school year, teachers had been academically involved with students for about seven months. About three months after the first garden lesson, on the last day of the program, the teachers completed the same questionnaire for each student.

The research team set up a camcorder to record 40 minutes of a routine classroom lecture. Both classes (control and intervention) were recorded at the same time in the morning. Students who did not have parental consent for the recording were placed outside the view of the camera lens. This occurred three times: before the intervention, half-way through the intervention (around

lesson five), and the last day of the intervention. Only the first and third video recordings were analyzed as the second set of data footage was unusable.

After the preliminary data was collected, the research team met with students in the intervention class for approximately 50 minutes, once a week, to survey the garden, teach a nutrition lesson, sample a fruit, vegetable or both, and collect student emotion responses.

## **Intervention**

The intervention consisted of 10 visits over 16 weeks to students during which, three activities took place. The students participating in the activities would tend the garden, listen to an interactive lesson, and sample food. Lessons occurred and data was collected between March and June, 2018. The largest gap between visits was two weeks which was due to holidays, school functions, ACT testing, or field trips where students were not available. When researchers were not visiting, students were responsible for watering and maintaining the garden.

The first activity was children working in the garden (i.e., watering plants, pulling weeds, and preserving a clean garden space) and documenting observations of the condition of the garden in personal journals. This took approximately 10 minutes. Students were encouraged to continue gardening activities outside of the weekly visit from researchers to sustain the garden coming to fruition. After returning to the classroom, students participated in an interactive lesson on a nutrition or gardening topics such as the life cycle of farm grown foods going from ground to store, the life cycle of a plant, healthy eating, how to read nutrition labels at a grocery store, food preparation, etc. To conclude the lesson, students indicated their emotion using the 'Feelings Chart' and were given a sample of a fruit or vegetable (sometimes both) to taste, discuss, and document in their journals. These three activities occurred in different orders to accommodate lesson plans and students' schedules.

The Center for Healthy Communities (CHC) provided the nutrition-based curriculum called

*Dig In!* (USDA, 2013) and the gardening resources needed to maintain plants throughout the present study. Volunteers from the CHC team were three interns who focusing their college education on nutrition and child education. The research team consisted of four members (one graduate student and three undergraduate students majoring in psychology). Their focus, was to plan lesson and food samples, take observational notes during focus group interviews, input data into database, and transcribe both audio and visual data. The research team encouraged constant collaboration between the principle, teachers, elementary students, and psychology and CHC team members.

### **Instruments**

To assess the possible impact of the intervention on academic and social behaviors, data was collected from the control group and the experimental groups using teacher completed questionnaires (Social, Academic, & Emotional Behavior Risk Screener; SAEBRS) and video-recorded classroom observations (Direct Behavior Rating Form; DBR). Emotion charts completed by students and art-based focus group interviews collected at the end of the intervention assessed the possible impact of the intervention on students' psychological sense of belonging and connectedness towards their school environment.

#### ***Social, Academic, & Emotional Behavior Risk Screener (SAEBRS)***

The SAEBRS is an 18-item rating scale used to identify student behavior in the classroom (Kilgus et al, 2013). Third and fourth grade teachers of the control and intervention group, respectively, completed this form before the initiation of the first lesson and then again before the last lesson of the gardening activities. Data collection for SAEBRS took place at the end of the school day, with each teacher completing a form for each individual student. While the SAEBRS has three subscales (Social Behavior, Academic Behavior, and Emotional Behavior), only Social Behavior and Academic Behavior were assessed in the present study. Teachers indicated the frequency of behaviors on a 4-point scale, ranging from 0-3 (0 = never, to 3 = almost always). Some

behaviors were reverse-scored so that a higher number reflected positive behaviors. Sub-scale scores were created by adding together scores on sub-scale items. Kilgus et al. (2016) provided evidence of strong internal consistency for the two subscales used in the present study (Social Behavior = .89 and Academic Behavior = .92). Based on a sample of 1279 elementary school children, Kilgus and colleagues reported strong correlations of between the two subscales of Social Behavior and Academic Behavior with the Behavioral and Emotional Screening System (BESS), which is a well-validated behavioral screener currently used in schools. This established concurrent criterion-related validity.

**Social Behavior Subscale.** Social behaviors included arguing, cooperation with peers, temper outbursts, disruptive behaviors, polite and socially appropriate responses toward others, and impulsiveness. Cronbach alpha was strong in the present study for the Social Behavior subscale (pretest = .90, posttest = .80).

**Academic Behavior Subscale.** Academic behaviors included interest in academic topics, preparedness for instruction, production of acceptable work, difficulty working independently, distractedness, and academic engagement. Cronbach alpha was strong in the present study for the Academic Engagement subscale (pretest = .915, posttest = .85).

### ***Direct Behavior Rating (DBR) Form***

The DBR was originally created to combine strengths of behavior rating scales and benefits of systematic direct observation (Chafouleas et al., 2009). It is a widely used instrument to assess classroom behavioral differences in all school levels from kindergarten to high school. Chafouleas and colleagues emphasize the speedy evaluation for observed behaviors, its ability to focus on specific behaviors, as well as the ability to be repeated when establishing baseline and post-intervention data. Observed behaviors are reported as percentage of time engaged in each of three behaviors: academic engagement, respectful behavior, and disruptive behavior. Kilgus et al. (2014) has evaluated the

utility of the DBR. Data was collected in 13 schools with a diverse sample of 1316 students and a diverse sample of 72 teachers reporting behavior observations of the students. Results suggested that the DBR provided accurate assessments of behavior.

**Academic Engagement Subscale.** Academic engagement from the students (as defined by Chafouleas et al.) was active and/or passive participation in the classroom activity. Behaviors included raising hands, writing, answering questions, talking about a lesson, listening to the teacher, reading silently, or looking at instructional materials.

**Respect Behavior Subscale.** Respect behaviors (as defined by Chafouleas et al.) were compliant and polite behavior in response to adult direction and/or interactions with peers and adults. Behaviors included a student following teacher direction, pro-social interaction with peers, positive response to adult request, or verbal/physical disruptions without negative tone/connotation.

**Disruptive Behavior Subscale.** Disruptive behaviors (as defined by Chafouleas et al.) were student action that interrupts regular school or classroom activity. Behaviors included a student out of seat, fidgeting, playing with objects, acting aggressively, talking/yelling about things that were unrelated to the classroom instruction.

**Observation and Coding for DBR.** In order to accurately observe students' daily, ritualistic classroom behavior with minimal intrusion, a camcorder was set up and recorded 30 to 40 minutes during a math lesson. These recordings were made in the intervention and control group classrooms during three points: before the intervention, during the middle of the intervention, and immediately before the last lesson. Only recordings before the intervention and at the end of the intervention were coded.

Ten minutes of each recording was coded for how often the three specific behaviors (academic engagement, respect, and disruptive actions) occurred for each child. Each coder noted

whether or not each behavior occurred every 15 seconds. For each child, a behavior could occur 0-40 times. Final data was reported as a percentage of occurrence. For example, if a child demonstrated respect behaviors 20 times, it was noted as 50%.

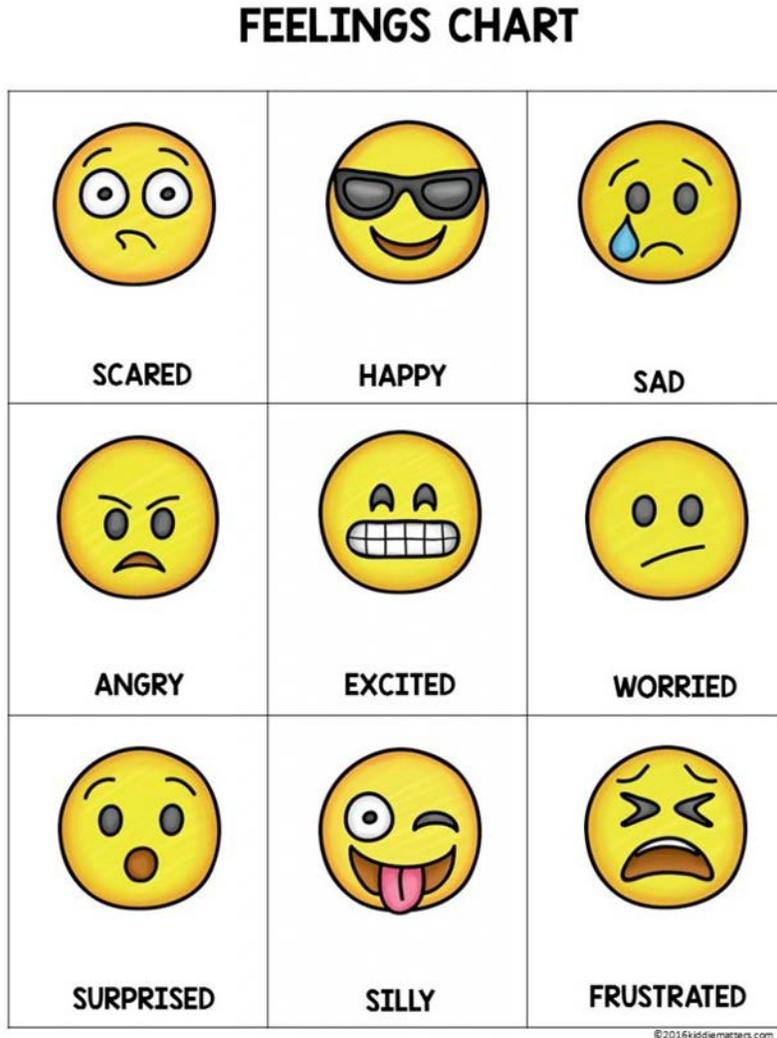
Each recording was coded by two coders. Coders were trained by one-on-one and group instruction on how to define each behavior, how to focus on specific behaviors, and how to create charts to collect data. The two coders compared the three categories of behaviors for each of the individual students. If the difference in coding was greater than 5 occurrences per 10 minutes, a third coder also code the behavior for the target individual. Inter-rater reliability was not calculated.

### ***Weekly Emotion Charts***

An emotion chart was given to the students in the intervention class (see Figure 1). This was a paper with multiple faces showcasing an array of emotions printed. The chart was completed at the end of each lesson by having each student choose a face and descriptor that most accurately represented their current mood. The chart consisted of nine different emotional faces: scared, happy, sad, angry, excited, worried, surprised, silly, and frustrated. Children were instructed to choose one face that best represented their mood, but many children choose more than one face. All emotions were recorded.

Figure 1

*Emotion Chart completed at the end of each lesson*



*Art-based Focus Group Interviews*

When the intervention was finished, students from the intervention class participated in a focus group interviews. Each group had four to five students participating. The focus group interviews took place outside, near or around the gardening area. Each group member was given the option to draw a picture or take a picture with a Polaroid camera to showcase what the gardening

intervention meant to them. The “Photovoice” method (Wang, 1997) is a way to engage students in discussion by allowing them to take a picture or draw a picture of something in their environment and present it to researchers. This encourages the group members to express themselves openly when providing feedback on the intervention (Mayaba & Wood, 2015). Students often completed both activities to take home to their families and friends or keep as tokens for themselves. Some students gifted their pictures to the researcher, however, it was not mandatory to turn in the pictures.

Once the art portion was completed, the students took over the discussion with two researchers, who asked several topic questions to keep the conversation focused. Topic questions included what students liked or disliked about gardening, what they learned from the activities and lessons, and what they would change if the experiment continued. Students also discussed how they used their gardening knowledge at home and if they talked about the garden outside the classroom with family or friends. They also discussed whether or not they would garden on their own or if they would continue the garden at school in the future.

During the discussion portion, a designated object, “Penelope the purple pen,” was used as a tool to take turns speaking within the group. This was intended to put the students in a leadership role and to enhance feeling comfortable when talking with their peers. Each researcher had a recording device to document the conversations between students. At the end of the day, the researchers transcribed the data into word documents, each assisting the other if there were issues with inaudible material or difficulties deciphering between individual voices.

From the transcriptions, a codebook was created to categorize the different topics the students discussed and developed. All four coders read the four different transcriptions to determine which major themes resonated across all four focus groups. Each individual coder created a list of topics found within the data and then compared and collaborated with other coders to define the

final categories. At that point, coders placed quotes from transcriptions into the designated categories that fit the definition. Inter-rater reliability was not calculated.

## Results

### **Research Question 1: What is the impact of a school gardening intervention on elementary students' behaviors within the classroom?**

Two quantitative instruments explored the possible impact of the gardening/nutrition lessons intervention on student behaviors in the classroom. This included the Social, Academic, & Emotional Behavior Risk Screener (SAEBRS) and the Direct Behavior Rating Scale (DBR).

#### ***Social, Academic, & Emotional Behavior Risk Screener***

Table 1 shows the means and standard deviations for the mixed between-within subjects analyses for the Social, Academic, & Emotional Behavior Risk Screener. A mixed between-within subjects analysis of variance was conducted to assess the impact of the gardening intervention on teacher-rated student social behavior across time (pre-intervention, post intervention). There was no significant interaction between groups (intervention/no intervention) and time, Wilks Lambda = .96,  $F(1, 28) = 1.03$ ,  $p = .32$ , partial eta squared = .04. There was a main effect for time, Wilks Lambda = .63,  $F(1, 28) = 16.49$ ,  $p = .0005$ , partial eta squared = .37, with both classes showing an increase in positive social behaviors as observed by the teachers over time. The main effect comparing the intervention class and the non-intervention class was not significant,  $F(1, 28) = .33$ ,  $p = .57$ , partial eta squared = .01.

A mixed between-with subjects analysis of variance was conducted to assess the impact of gardening intervention on teacher-rated student academic behavior across time (pre-intervention, post intervention). There was a main effect for time, Wilks Lambda = .36,  $F(1, 27) = 48.41$ ,  $p < .0005$ , partial eta squared = .64, with both classes demonstrating an increase in academic behaviors as observed by the teacher over time. This main effect was qualified by a statistically significant

interaction between groups (intervention/no intervention) and time, Wilks Lambda = .64,  $F(1, 27) = 14.91$ ,  $p = .001$ , partial eta squared = .36. Teacher observed academic behaviors increased more in the non-intervention class as compared to the intervention class over time. The main effect comparing the intervention class and the non-intervention class was not significant,  $F(1, 27) = .38$ ,  $p = .54$ , partial eta squared = .01.

**Table 1**

*Pretest and posttest means (standard deviations) for social, academic, & emotional behavior risk screener by intervention*

Social, Academic, & Emotional Behavior Risk Screener Subscales		
	Social Behavior	Academic Behavior
Intervention		
Pretest	15.53 (3.6)	13.50 (5.6)
Posttest	17.23 (1.3)	15.44 (3.5)
No Intervention		
Pretest	14.46 (3.5)	10.31 (2.3)
Posttest	17.31 (2.0)	17.08 (2.1)

***Direct Behavior Rating Form***

Table 2 shows the means and standard deviations for the mixed between-within subjects analyses for the Direct Behavior Rating Form. Means reported are mean percent of time each behavior was expressed. A two-way between-groups analysis of variance was conducted to explore the impact the intervention (intervention, non-intervention) and time (time one, time two) on

frequency of academic engagement. Time was a between-subjects variable as different students were captured in the video recordings at time one and time two. There was no significant interaction between intervention and time,  $F(1, 40) = .28, p = .60$ , partial eta squared = .007. There was a significant main effect for intervention,  $F(1, 40) = 5.60, p = .02$ , partial eta squared = .12, with students in the non-intervention class demonstrating more academic engagement. The main effect for time was not significant,  $F(1, 40) = 1.85, p = .18$ , partial eta squared = .04.

A two-way between-groups analysis of variance was conducted to explore the impact the intervention (intervention, non-intervention) and time (time one, time two) on frequency of respectful behaviors. There was no significant interaction between intervention and time,  $F(1, 40) = 2.03, p = .16$ , partial eta squared = .05. There was a significant main effect for intervention,  $F(1, 40) = 21.14, p = .0005$ , partial eta squared = .35, with students in the non-intervention class demonstrating more respectful behaviors in the classroom. The main effect for time was not significant,  $F(1, 40) = 3.04, p = .09$ , partial eta squared = .07.

A two-way between-groups analysis of variance was conducted to explore the impact the intervention (intervention, non-intervention) and time (time one, time two) on frequency of disruptive behaviors. There was no significant interaction between intervention and time,  $F(1, 40) = .07, p = .79$ , partial eta squared = .002. There was a significant main effect for intervention,  $F(1, 40) = 16.12, p = .0005$ , partial eta squared = .29, with students in the intervention class demonstrating more disruptive behaviors in the classroom. The main effect for time was not significant,  $F(1, 40) = 1.58, p = .22$ , partial eta squared = .04.

**Table 2**

*Recording one and recording two means (standard deviations) for academic engagement, respect, and disruptive behaviors in the classroom by intervention*

	Direct Behavior Rating Scales		
	Academic Engagement	Respect	Disruptive
Intervention			
Pre-intervention Recording	64.17 (24.85)	63.54 (17.53)	33.63 (24.62)
Post-intervention Recording	75.09 (20.66)	78.17 (20.11)	43.42 (27.34)
No Intervention			
Pre-intervention Recording	80.01 (12.21)	91.36 (8.69)	9.55 (12.14)
Post-intervention Recording	85.72 (10.72)	92.84 (3.72)	15.91 (8.15)

*Note:* Number in table reflect mean percent of time expressing each behavior.

**Research Question 2: What is the impact of a school gardening intervention on elementary students' psychological sense of belonging and connectedness towards their school environment?**

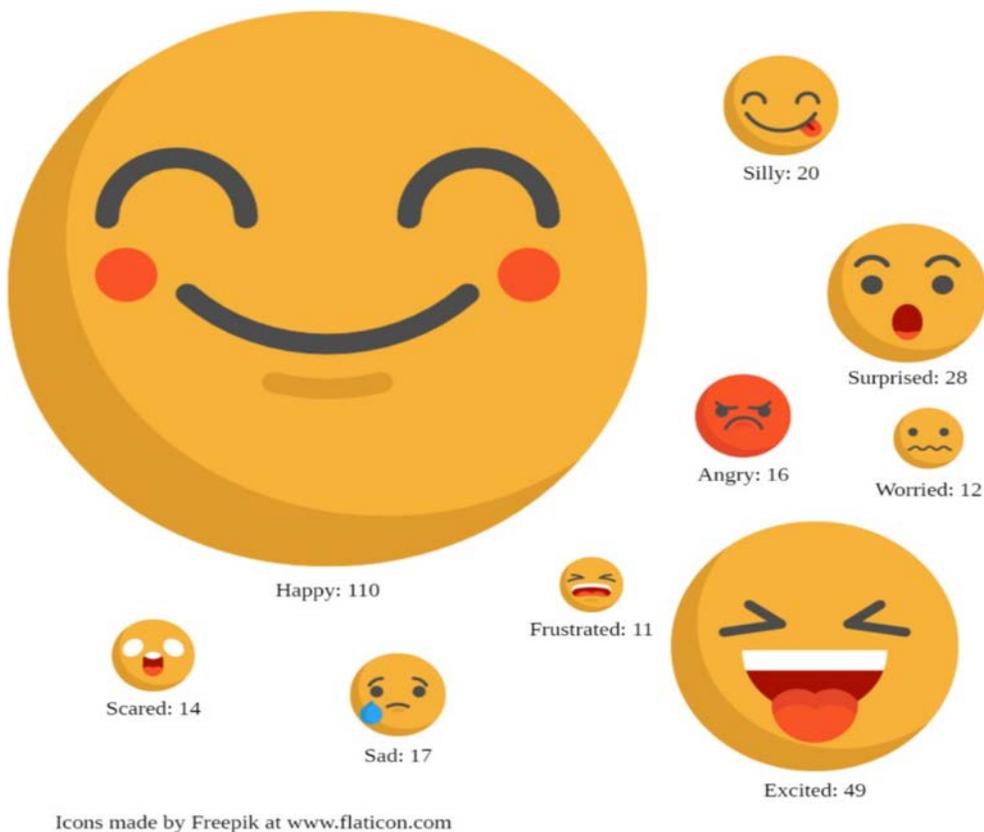
Two qualitative instruments explored the possible impact of the gardening/nutrition lessons on students' psychological sense of belonging and connectedness towards their school environment. This included students in the intervention group reporting emotions after each lesson and focus group interviews with students in the intervention group after the conclusion of the intervention.

## *Weekly Emotion Charts*

Students in the intervention class reported their immediate emotion at the end of each nutrition lesson. This occurred on 10 separate days. The most commonly reported emotion each time was feeling happy. The range of frequencies for the percent of students reporting feelings of happiness was 28.6% to 63.2%, with 8 out of 10 times 50% or more students reporting feeling happy. The second most frequently occurring emotion (across six lessons) was feeling excited. The range of frequencies for the percent of students reporting feeling excited was 14.3% to 52.6%. Figure 2 displays an info graph for emotions.

**Figure 2**

*Info graph of emotion frequency for intervention class*



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*Note:* Size of icons represents frequency of responses

## **Focus group interviews**

Discussions during the focus groups were analyzed independently by four coders. Five common topics of discussion were found across the focus groups: education health and nutrition, happiness, relationships, empowerment, and rippling ecological effect. Together, the four coders developed definitions that fit each category. Appendix A displays additional student comments for each theme.

**Education Health/Nutrition.** The theme of health education and nutrition came from common expressions students made in regard to learning new things about food, gardening and healthy eating. Specifically, students articulated a perceived increase in understanding and knowledge concerning how different aspects of food impacts their physical health and daily life rituals. Students stressed the value of engaging in this process through experimental learning 22 times throughout the interviews. For example, one student said, “It’s fun learning experiments because... some people don't even know and some people... kids don’t even eat vegetables.” Another student stated, “I thought it was a good thing that you were coming to teach people who didn't have experience [gardening]” and another student added, “Relaxed, yeah. I feel relaxed because like, it’s out in the nature and it’s like a garden where we can do things and not be stuck in class.”

**Happiness.** The third theme identified was happiness. Happiness was defined as students describing sentiments of joy, pride, and enhanced relaxation in relation to their participation in the school gardening program. Students expressed this sentiment 20 times during the interviews. One student specified how the garden directly impacted them, “When I pass the garden it makes me feel happy, ‘cause I see the tomatoes and all the pants are growing.” Another student said, "It was fun ‘cause you're getting dirty!” Some students were happy with each other, “A fun social experiment, [sick] doing it with my friends in the class.”

**Relationships.** The final theme, relationships, was defined as students articulating the

school garden program as helping them build strong social connections with other students, their teachers, the research team, and with nature. Across the four groups, this theme was discussed 16 times. Some of the students talked about their interactions with family members. When asked if the students told their family about the garden, one replied “Yeah, my mom always comes here and waters stuff. Even though she has her baby.” Another student felt the connections with nature when talking about the plants they said, “Yeah, you’re interacting with them, you’re engaging like basically like they’re people.” One student had a short response when asked what their favorite thing about the garden was? They replied, “You.”

**Empowerment.** Another theme that arose out of the interviews was empowerment, which we defined as students indicating a perceived increase in feelings of agency over their actions (e.g., over the garden, between peer and family relationships, and their relationship with food), a sense of ownership and pride over the school garden as well as personal responsibility. This sense of responsibility emanated through their expressions 14 times. One student mentioned, “Once I get this err certain new garden at our house... I just think it's gonna be a success.” Another student stated, “I felt excited the first day. [Excited] that we’re gonna grow a garden by ourselves,” and a third student said, “I felt really good ‘cause we can like water, and like feed it.” Another student suggested, “...we... can probably make another garden by ourselves”.

**Rippling Ecological Effect.** This theme was delineated as students described the transfer of their knowledge and health behaviors gained from the school garden program to an ecological setting outside the school environment (i.e., home, grocery store). During the interviews, this topic was discussed on 14 occasions. Some students expressed their knowledge when grocery shopping, “I told her to like buy more vegetables that we made, but like more vegetables. Buy more fruit.” Other students thought about the future when they said “I’m going to come here all the time 'cause my grandma lives on a nearby street so I usually walk here and play...” One individual, in particular,

wanted to help others with a garden, “my mom is planting a plant and I'mma help her...so I have the experience building plants and stuff.”

## **Discussion**

The focus of this study was to examine possible benefits around school gardening with elementary school students. The focus was on the potential impact a school gardening intervention on elementary students' behaviors within the classroom, as well as the psychological sense of belonging and connectedness towards their school environment. Overall, the gardening intervention did not impact the classroom behaviors assessed, yet qualitative results suggest important benefits from the intervention. This is consistent with previous research exploring the impact of school gardens on children. Blair (2009) reviewed 12 quantitative studies and 7 qualitative studies. While support for positive effects of gardening on attitudes and behavior were not evident in quantitative studies, qualitative studies supported benefits of school gardens on social and environmental behaviors. Specific findings are discussed, below.

### **Student Classroom Behaviors**

What is the impact of a school gardening intervention on elementary students' behaviors within the classroom? This research question was assessed with the SAEBRS questionnaire filled out by teachers and the DBR scale filled out by researchers compared both pre intervention behaviors to post intervention behaviors. Data was collected in the intervention and control classrooms. Results of these measures indicated some differences were detected.

#### ***Social, Academic, & Emotional Behavior Risk Screener (SAEBRS)***

It was expected that children in the intervention class would experience an increase of social and academic behaviors at posttest, compared to pretest and compared to the 3rd grade control group. Students, regardless of classroom, increased the amount of positive social behaviors and academic behaviors over time. These findings align with past research expressing social and

academic growth over time for students in a learning environment (McDevitt & Omrod, 2020). This significant growth socially and academically, could be due to students maturing naturally over the course of three months rather than directly related to the school garden.

Another reason social and academic behaviors increased for the control group, along with the intervention group, could be due to all children (regardless of group) having access to the garden, even though they did not participate in the structured lesson plans and garden activities. While the garden was built for the intervention class, other grades in the school could observe the garden, and clean the garden when necessary thereby receiving some effect of its presence. A future comparison that would help eliminate this carryover would involve multiple schools to compare; one school without a garden compared to the other that would have the garden and education program.

Interestingly, in the present study, the control group expressed more growth in academic behaviors in the posttest as compared to the intervention class. Given the fact that the questionnaire was filled out by two different teachers with potentially different teaching styles, it could be they have different evaluation strategies to assess students' classroom behaviors. Follow up interviews with the teachers could illuminate this possibility.

### ***Direct Behavior Rating Form (DBR)***

The Direct Behavior Rating Form was used to compare behaviors in the classroom prior to and after the intervention. It was expected that students in the intervention class would express greater academic engagement, more respectful behaviors, and less disruptive behaviors as compared to the control group at posttest. This was not supported by the observations. The control group at both pretest and posttest expressed greater academic engagement, more respectful behaviors, and less disruptive behaviors as compared the intervention class. It is possible that these findings reflect basic differences in the classroom environment and teaching styles for the specific classrooms and

teachers who participated in this study. For example, a behavior in one class may be more acceptable than the same behavior in a different class. Students in the intervention class sat on large, blowup rubber balls as chairs, whereas the control class utilized solid, four-legged, standing chairs. “Fidgeting” was considered a disruptive behavior on the DBR form, which could have falsely increased disruptive behaviors for the intervention class with balls as chairs, compared to the other class that did not have this type of furniture. While the DBR form allows users to record the number of times a behavior occurs, it does not account for the duration of the behavior or the intensity. A more sensitive instrument would be valuable in future studies. Additionally, it is possible that the behaviors noted on the DBR are simply not influenced by the gardening intervention. Future research could explore other important, positive behaviors that might be impacted by a gardening intervention.

### **Student Psychological Sense of Belonging and Connectedness towards their School Environment**

What is the impact of a school gardening intervention on elementary students’ psychological sense of belonging and connectedness towards their school environment? This research question was assessed with the weekly emotion chart completed by students in the intervention class after each gardening/nutrition lesson and through focus group interviews with students in the intervention classroom. Focus group interviews occurred at the end of the intervention. Data from the weekly emotion chart were not useful. Results of the focus groups indicated that students felt the garden and nutrition lessons were educational, instilled feelings of happiness, empowerment, and created social relationships that continued beyond the immediate intervention.

#### ***Weekly Emotion Chart***

The use of the emotion chart was to capture the transitory emotions felt by students after gardening. The approach has not been used by other researchers and appears problematic in the

present study. The weekly emotion charts did not have as strong of a significance when attempting to measure how students felt after the garden activities and nutrition lesson. At times, students sitting in a group would hear one another's choices and the rest of the group would follow and copy as their answers for the day. This occurred on numerous occasions with some groups of students expressing they were "scared" after hearing a conversation between two students. During one lesson when gathering emotion chart data, a student confided to a researcher that they were "worried" because of a fight their parents had the night before. This indicates other aspects of students' lives could be impacting their responses.

It is quite possible as well that fatigue set in during this section of the lessons and students did not consciously choose an emotion for that day. Having more of a structured setting when prompting the students to pick an emotion might clean this up. For example, instruct students to choose emotion independently, then discuss with groups if they want to. Researchers could also use this as an opportunity to establish a why with the emotion possibly drawing on whether or not the garden elicited emotion decision for the day.

Even though this activity did not accurately measure students' emotions after the gardening lesson, it did express a majority of positive emotions from the students portraying the activity as a desirable education tool. Over the course of the 10 week visits, students were becoming more acclimated with the activity with some students analyzing their feelings outside the garden and outside school in general. While this measurement may not express emotions around the garden, it does share some insight into a need students may have to momentarily analyze their own thoughts and feelings regarding their lives. Given the amount of positive emotions students recorded around the garden, it follows other research that students state positive responses to a school garden.

### ***Art-based focus group interviews***

Focus group interviews assisted in allowing students to express themselves through the art

of taking pictures, drawing illustrations, and discussing the program's strengths and improvements. When the students took photos of their specific subject matter while thinking about the garden, this helped draw attention to the elements of the program that the students identified with while creating a supportive, sharing environment. One research question of this study addressed whether the garden impacted the students' sense of belonging and connectedness towards their school environment. Students were able to not only express their relationship with the garden and how it impacted them, but also expand on the vast array of relationships that multiplied due to the gardening program.

Using the photovoice method and interviews, researchers were able to transcribe and analyze the feedback given from students, compartmentalize the data, and develop five different topics that students perceived from the garden experience. The theme that occurred most often was related to the nutrition knowledge students received during the program. Students who articulated their understanding of the lessons and activities displayed a higher level of interest when presented with the garden education. The other major theme that developed was the positive emotions like joy, pride and relaxation that materialized from the intervention. Students expressed happy sentiments when they "walked by the garden" and noticed "it growing". There was an overall sense of pride that some students felt when they witnessed the plants flourishing over the course of the 10 weeks. Moreover, empowerment and rippling ecological effect both divulged strong responses from students expressing feelings of "pride in their work" and being able to share their knowledge with others. Empowering students encourages engagement in activities to maximize learning, as well as provides opportunities for participants to exercise decision making and leadership skills. In some cases, students do not always have opportunities in their private lives to practice healthy and positive empowering responses so gardens would be beneficial in advocating for this safe activity. A surprising theme that came out of the interviews was relationships. Relationships between gardening

members were not the only ones to flourish from the garden, but also with their teachers, the researchers themselves, as well as their family and friends outside of school. Having an activity in a place where elementary students spend a majority of their time and that encourages positive, healthy, relationships holds real world application as well as teaches beneficial social practices.

The students who participated in the gardening intervention expressed these many positive outcomes. Yet, without interviewing students in the control group, it is unknown whether the garden/nutrition lessons are responsible for these feelings.

### **Future Research and Limitations**

Previous research has established the benefits of school gardens for the participants. Emekauwa (2004) reported improved scores in Language Arts for students utilizing school gardens. Draper and Freedan (2010), as well as Fulford and Thompson (2013), found the benefits of gardening positively impacting social relationships and noted health benefits associated with increased knowledge of fruit and vegetables. Savoie-Roskos et al (2016) revealed that majority of studies they reviewed indicated an increase in fruit and vegetable consumption of participants in gardening interventions. The present study found only limited support for beneficial outcomes of the gardening intervention. Quantitative data (Social, Academic, & Emotional Behavior Risk Screener and Direct Behavior Rating Form) did not reveal improved classroom behaviors. This is likely because of limitations in design and methodology. Having different classrooms and grade-levels co-vary with the intervention make it difficult to conclude that the gardening intervention was responsible for the positive outcomes noted in the qualitative data, as well as providing an understanding of why the quantitative data did not establish positive outcomes from the intervention. The value of using a naturalistic setting enriches external validity of this study, yet undermines internal validity. An improved design would compare the same class with and without the garden activity which would eliminate the differences between the teaching styles and the

classroom. It is possible that not enough information was collected on how often the students attended the garden outside the weekly lessons. Was attending the garden encouraged by the school or teachers? How often did the students visit the garden outside of school? If the students did not routinely maintain the garden, then it is possible that once a week is not enough time to influence student behaviors in the classroom. Future research could overcome some of these limitations and provide clearer evidence of the impact of school gardens.

### **Implications**

With the results of this research indicating gardens create a positive experience for students, as well as encourage relationships with others, it would be beneficial to make time in school education for a garden nutrition program. Perhaps physical education courses could incorporate this program into its curriculum, allowing students the opportunity to pair exercise with good eating habits. These topics regarding food and farming may also provide opportunities for students to learn about resources in the community such as where they can go to access food when in need. Bridging the students to their communities will strengthen the community itself having a positive ripple effect.

All in all, it is not just education or a fun activity that comes out of community gardening in schools. In this study, gardening also provides outlets for its members to congregate with one another and work together to achieve a common goal. It allows for the members to grow as individuals and strengthen their social skills with diverse communities. Having a garden brings another element to schools that allows students to learn, not just topic subject material, but useful, positive, and empowering skills that may not otherwise be acquired in or outside of school. With a garden, more positive associations can be made within school, which creates a healthier and encouraging environment that could ameliorate the learning process. Additional research should be focused on the long term effects gardens have on students social relationships as well as more in-

depth looks into how the garden impacts their behaviors in the classroom.

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Appendix A

<p style="text-align: center;"><b>Themes</b> (frequency across all four focus groups)</p>	<p style="text-align: center;"><b>Quotes</b></p>
<p><b>Education Health/Nutrition (22):</b> Students articulated a perceived increase in understanding and knowledge concerning how different aspects of food impacts their physical health, and daily life rituals. Students stressed the value of engaging in this process through experiential learning.</p>	<p><i>“First when the gardening people came, I didn’t know about vegetables, cause I wasn’t really eating them. And then when I started learning. I learned a lot from them.”</i></p>
<p><b>Empowerment (14):</b> Students indicated a perceived increase in feelings of agency over their actions (e.g. over the garden, between peer and family relationships, and their relationship with food), a sense of ownership and pride over the school garden, as well as personal responsibility</p>	<p><i>I felt proud because we served the cafeteria and were giving them food and so...kids getta learn how to like what vegetables.</i></p>
<p><b>Happiness (20):</b> Students described sentiments of joy, pride, and enhanced relaxation in relation to their participation in the school gardening program</p>	<p><i>When I pass by the garden it makes me feel happy, cause I see the tomatoes and all the plants are growing.</i></p>
<p><b>Rippling Ecological Effect (14):</b> Students described transferring their knowledge and health behaviors gained from the school garden program to ecological settings outside of the school environment (i.e. home).</p>	<p><i>The first day, I was excited to tell my mom and my whole family about how we’re gonna grow a school garden. And we taste new foods, and stuff.</i></p>

**Relationships (16):** Students articulated perceiving the school gardening program as helping them build strong social connections with other students, their teacher, the research team, and with nature.

*You should come back [referring to the research team]. You should do this all the time. Then you should make different flower beds with different students, then interact with them, so they can learn.*