

School Gardens as a Strategy for Increasing Fruit and Vegetable Consumption

Erin Oxenham, MS, RD; and Amber D. King, MS, RD

Please note that this study was published before the implementation of Healthy, Hunger-Free Kids Act of 2010, which went into effect during the 2012-13 school year, and its provision for Smart Snacks Nutrition Standards for Competitive Food in Schools, implemented during the 2014-15 school year. As such, certain research may not be relevant today.

ABSTRACT

School gardens as a form of nutrition education have become widespread. It is well known that children fall short of the daily recommended intake of fruit and vegetables. School-garden based programs show promise as a method of hands-on learning that promotes and increases fruit and vegetable consumption among school-aged children. There is little research, however, specific to the impact of school garden based programs on helping to explain why children choose the foods they do, the barriers to implementation of such programs and the feasibility of utilizing school grown produce in the school meal program. This paper reviews the impact of nutrition education interventions on children's food choices, specifically that of school-based gardens, and provides recommendations for implementation of such programs and areas for further research.

School Gardens as a Strategy for Increasing Fruit and Vegetable Consumption

Leading national organizations including the School Nutrition Association recognize the importance of good nutrition for development and learning. Nutrition education paired with healthy food served in the school setting is crucial to physical and intellectual growth. It is well known that fruit and vegetable consumption among children is of utmost importance to overall health, however recommended daily intake amongst most children remains inadequate. Lorson, Melgar-Quinonez, and Taylor (2009) examined dietary intake data collected on 6,513 children aged 2-18 in the 1999-2002 National Health and Nutrition Examination Survey and compared it to recommendations for fruit and vegetable intake in the 2005 U.S. Dietary Guidelines for Americans. With fruit juice and French fries included in total fruit and vegetable consumption, the researchers found that only 50% of children ages 2-5 met recommendations for fruit intake, and 22% met recommendations for vegetable intake. In children ages 6-11, 26% met recommendations for fruit intake, and 16% met recommendations for vegetable intake.

Many children have limited exposure to healthy foods and often do not know where foods come from or how they are grown and prepared. Using the school setting to introduce and reinforce healthy behaviors through different forms of nutrition education, including methods such as gardening and farming, is becoming widespread among schools in urban and rural settings. School garden and farm-based programs have the potential to promote health and well-being in children, and may ultimately influence food choices through adolescence and adulthood.

Nutrition Education Interventions

Nutrition education interventions designed to increase fruit and vegetable intake must be age specific and aim to target groups of youth with realistic, stimulating programs. Programs that involve children in the growing, procurement, and cooking processes can provide increased access

to fresh produce and help link classroom education with hands-on experiences. These efforts may help build a foundation of lifelong healthy diet choices. Dietary intervention trials that provide nutrition education through activities, hands-on food preparation, and taste-testing have been shown to increase consumption of fruits and vegetables and increase levels of nutrition knowledge among study participants (Knai, Pomerleau, Lock, & McKee, 2006).

Morris and Zidenberg-Cherr (2002) evaluated the effectiveness of a nutrition education program, based on Social Cognitive Theory, on improving children's vegetable preferences. Fourth grade students ages 9 to 10 (n=205) were split into three groups; nutrition education only (NL), nutrition education plus gardening (NG), and a control group (CO). The students completed pre- and post nutrition knowledge questionnaires and vegetable preference surveys and took part in 17 bi-weekly nutrition education sessions (NL) and school gardening projects (NG) that complemented the nutrition lesson plans. Nutrition knowledge scores for students in the NL and NG groups were significantly higher than those in the control group. Vegetable preference scores for the NL and NG groups were greater than the CO group for broccoli and carrots. The NG group also had higher scores for vegetable preference of snow peas and zucchini than the other two groups. Results indicated that exposure to nutrition education lessons improved nutrition knowledge and exposure to new vegetables improved student's preferences for several vegetables. Results were also verified at six-month follow-up; both the NL and NG groups remained significant for carrots, and the NG group was still significant for broccoli, snow peas and zucchini.

McAleese and Rankin (2007) studied the effects of garden-based nutrition education on 6th graders' (n=99) fruit and vegetable consumption. The study consisted of a control and two treatment groups. Both treatment groups participated in a 12-week nutrition education program, with one group also participating in hands-on garden-based activities. Each subject in the study completed three food recall workbooks before and after the intervention. The students who received the garden-based education increased their fruit intake by 1.13 servings and their vegetable intake by 1.44 servings per day. In the same group, vitamin A intake increased significantly by 181.99 ug RAE/day. Vitamin C mean consumption also increased by 85.27 mg/day, and fiber intake significantly increased by 4.24 grams per day. No significant changes were noted in fruit, vegetable, vitamin A, vitamin C, or fiber intakes amongst the control group and the group receiving nutrition education alone. Both of these studies show that a garden-enhanced nutrition education program is effective at improving nutrition knowledge and fruit and vegetable intake among school-aged children.

Multi-component school-based interventions that combine classroom education with foodservice and parental components may improve fruit and vegetable consumption among children (Blanchette & Brug, 2005). Hoffman, Franko, Thompson, Power, and Stallings (2009) examined the effects of a multi-component fruit and vegetable promotion program on consumption by kindergarten and first grade students. The program included cafeteria, classroom, and family components. Fruit and vegetable consumption at lunch was measured in the cafeteria using plate waste analysis. At the end of one year, the experimental group consumed more fruit and vegetables overall. However, by the second year vegetable consumption decreased to that of the control group, while fruit consumption remained high.

School Gardens for Hands-on Learning

Increasing self-efficacy by providing hands-on learning experiences and effective problem-solving knowledge should improve students' confidence in their ability to make healthy choices. A form of hands-on learning, school gardens have been implemented nationwide. In many different forms, from urban potted gardens to gardens in place of landscaping, they have been increasing in popularity over the last decade. The National Farm to School Network estimates that over 2,000 farm to school programs operate in 42 states, serving over 8,900 schools (www.farmentoschool.org). The Improving Children's Health through Farming Food and Fitness Program, a pilot study based in California, incorporates agriculture into the school environment, linking school, family and community activities (Heneman, Junge, Schneider, & Zidenberg-Cherr, 2008). The program aims to establish cafeteria salad bars, connect curricula by subject and grade to activities, develop a garden "laboratory" to help link nutrition education with food choices, and develop a composting system to

reduce lunchroom waste. The program's multi-faceted nature involves students, teachers, and staff in activities that aim to increase awareness and improve nutrition knowledge and dietary choices. The Ventura Unified School District also has a program that aims to use food, gardening, farming, and classroom education as part of a comprehensive health program with a cross-curriculum approach (Lefebvre, 2007). Food and nutrition education is tied into violence prevention, critical thinking, reading, and emotional health, amongst other learning skills. The project involves using school staff and teachers to integrate food with math, science, and social studies lessons. In theory, these programs are a welcome addition to the classroom as a place to learn and develop new ideas. Many programs claim success, but more well designed studies are needed to report just who benefits and how. Robinson-O'Brien, Story, and Heim (2009) have provided important considerations for implementing and evaluating garden-based youth nutrition-education programs."

Robinson-O'Brien and colleagues (2009) reported that many educators are including gardening and farm-based nutrition education as teaching tools and that many schools are using gardening as part of local wellness policies. The Wisconsin Homegrown Lunch Project (Kloppenburg, Wubben, & Grunes, 2008) has been operating in the Madison Metropolitan School District since 2002. It operates with the support of several grants and as a component of their local wellness policy. The program aims to increase the amount of locally-grown foods served in school cafeterias as well as to inform and educate students on farming, gardening, and cooking practices. Each participating school is paired with a local farmer who hosts field trips, as well as "farmer in the classroom" lessons and taste-testing. Two obstacles of the program's success include lack of food-preparation facilities in individual school kitchens and inadequate supply of local produce. The Baltimore school district, an 85,000 student school system, began serving peaches from local orchards and now maintains a 33 acre farm where produce is grown by students for use in schools city-wide (Krome, 2009).

Parmer, Salisbury-Glennon, Shannon and Struempfer (2009) studied 115 second grade students and their knowledge, preference, and consumption of fruits and vegetables as part of a classroom and classroom/gardening program. The results indicated that participants who received nutrition education alone, as well as nutrition education and gardening education had increased nutrition knowledge and taste ratings than the control group. In addition the group that received gardening education was more likely to eat vegetables in a lunchroom setting. This evidence is promising; additional research should focus on different types of garden and food experimentation settings, different age groups, and peer and child-adult relationships.

Ozer (2007) reviewed the effects of school gardens and dubbed them "learning laboratories." She estimated there are over 2,000 school gardens in the state of California. Graham, Beall, Lussier, McLaughlin, & Zidenberg-Cherr (2005) surveyed 9,805 California school principals to determine opinions related to school garden practices, attitudes associated with school gardens and possible barriers to having school gardens. The 43% of school principals who responded (n=4,194) stated the most important reason for having a garden was to enhance academic instruction and that gardens were most used to teach science, environmental studies, and nutrition. The principals thought the school gardens were only slightly effective at enhancing the school meal program.

Fresh Fruits and Vegetables in School Nutrition Programs

School nutrition programs are serving fresh foods that support the attitudes taught in the classroom and garden setting. The Berkeley Unified School District, with the help of a grant from the Chez Panisse Foundation, serves locally grown fruits and vegetables (organic when possible) and local organic hormone-free milk and has become a model for school lunch programs nationwide (Severson, 2004). However, the Berkeley Unified School District falls short in funding by approximately \$1 for every lunch served. The School Nutrition Association estimated the average cost of a school lunch that meets federal nutrition standards has increased 10 percent since the 2007-2008 school year from \$2.63 to \$2.90 (Peterson, 2008), but schools only received a 4.3% increase in federal funding.

Including more school-grown produce may help meet the goal of providing fresh, healthy foods while working under budgetary restrictions. However, the issue remains as to how or if incorporating school-based garden-grown foods into school meal programs on a widespread basis is feasible. Some examples of putting school-grown foods to use would be using them in existing recipes or providing them as part of a snack program; however, significant challenges remain related to quality, quantity, labor, and food safety.

To further utilize school-grown foods, the waste from procurement and production can be used to make compost which can then be used to fertilize new crops, utilizing the ideas of sustainable agriculture. The Davis Joint Unified School District (DJUSD) in Davis, California implemented a composting program as part of its Farm to School Connection which links local farms to students through farmers' market salad bars, classroom education, farm tours and waste management (Graham, Feenstra, Evans, Zidenberg-Cherr, 2004). A food waste composting system was piloted during the 2000-2001 school year at three schools in the DJUSD with a goal of reducing lunch waste while involving students in the composting and recycling process. In the pilot year, the program generated \$6,230 in decreased disposal fees and is now being practiced in every elementary school in the district.

Resources for School Garden Implementation

The Edible Schoolyard, a program established in 1995 and supported by the Chez Panisse Foundation, is a one acre garden on middle school grounds in Berkeley, California (<http://www.edibleschoolyard.org/>). The gardening education is a part of each student's core curriculum and incorporates math and science lessons into hands-on experiences. Lesson plans for the garden have been developed and are available online for adaptation. The program also hosts an Edible Schoolyard Academy where educators can attend workshops and gather ideas for implementing new programs. The Edible Schoolyard is a pioneer among school-based gardens and now has multiple affiliates across the country. The National Gardening Association (<http://www.kidsgardening.org/>) also hosts workshops and provides grants to schools interested in developing curriculums as well. State and local extension programs also offer expertise in garden implementation (www.schoolgardenwizard.org). Other resources include the California School Garden Network (www.csgn.org), Real School Gardens (<http://www.realschoolgardens.org/>), and the Community Food Security Coalition (www.foodsecurity.org).

Strategies for Implementation of School Gardens

Some barriers to implementation of school-garden based learning programs are funding, staffing, and time (Ozer, 2007). Often, teachers are responsible for maintaining gardens in addition to their other duties, as well as on school vacations. Most school gardens rely heavily on donations of funding, labor and materials from school and community members. Funding may come partly from local government funds, but often, successful school gardens utilize corporate grant programs, such as the Lowe's Outdoor Classroom Grant Program (www.lowes.com), develop partnerships with nonprofit organizations, and elicit donations of money and time to help sustain the health and production of the garden. Space may also be an issue, especially in the urban school environment. As mentioned earlier, it has been recommended that school gardens take the place of some landscaping which may make space more available. Potted gardens on rooftops and in entrance ways can also be used as space saving gardening techniques. Climate is of utmost importance to a garden's success; therefore, alternatives to outdoor gardens may also become necessary in certain parts of the country where summer is the optimal growing season. Using windowsills, indoor spaces and container gardening that can be moved from place to place may be options for gardening in the colder climates in winter months. A parent volunteer network may also help with garden maintenance, while also allowing parents to participate in their children's school activities. Parents should be included in the education process and may benefit from new ideas surrounding fruits and vegetables. Parent involvement can be increased through parents as garden volunteers and take-home parent education materials that include easy, healthful recipes, as well as tips for grocery shopping. A system that includes students, parents, teachers, administrators, school nutrition

personnel, and custodians, and so forth would be optimal for garden support and success. Schools with successful programs have support from administration, as well as students and parents (Kloppenborg et al, 2008).

School garden programs require a long-term commitment by the school community to be sustained. These programs require involvement from different groups to be successful from year-to-year. School garden programs that achieve improved health and education outcomes should serve as a model for new programs. The evaluation and research in this area may help with the design, implementation, and integration of school-based gardens into new schools (Ozer, 2007).

CONCLUSION

In order for nutrition education programs to be effective at influencing behavior modification among youth, they must be engaging and considerate of the age and cultural groups they serve. Using the school setting for garden-based nutrition education is a promising tool to increase fruit and vegetable consumption among youth. Studies indicate some positive effects of classroom nutrition education and gardening on youth opinions and choices of foods, but more research is needed to better understand why children choose the foods they do, and how to impact lifetime food choices. The results should also help state and local program managers, school nutrition professionals, and nutrition educators design school gardening curriculums that assist children and their families in making healthy choices. Studies that demonstrate the effectiveness of garden-based programs for increasing youth's produce consumption are needed, as are studies that identify the barriers to school garden implementation and the feasibility of incorporating school-grown produce into the school meal program.

The move toward sustainability, composting, eating locally, and supporting local farming fits perfectly with farm-to-school and school garden-based programs. Ensuring these programs implement best practices while serving as alternative classrooms helps meet the needs of students on an educational level, in addition to increasing awareness and community involvement.

REFERENCES

- Blanchette, L., & Brug, J. (2005). Determinants of fruit and vegetable consumption among 6-12-year-old children and effective interventions to increase consumption. *Journal of Human Nutrition and Dietetics*, 18, 431-443
- Graham, H., Beall, D. L., Lussier, M., McLaughlin, P., & Zidenberg-Cherr, S. (2005). Use of school gardens in academic instruction. *Journal of Nutrition Education and Behavior*, 37, 147-151.
- Graham, H., Feenstra, G., Evans, A. M., & Zidenberg-Cherr, S. (2004). Davis school program supports life-long healthy eating habits in children. *California Agriculture*, 58, 200-205.
- Heneman, K., Junge, S. K., Schneider, C., & Zidenberg-Cherr, S. (2008). Pilot implementation of the improving children's health through farming, food, and fitness program in select California schools. *Journal of Child Nutrition and Management*, 32 (1). Retrieved June 15, 2009, from <http://www.schoolnutrition.org/Content.aspx?id=8324>.
- Hoffman, J. A., Franko, D. L., Thompson, D. R., Power, T. J., & Stallings, V. A. (2009). Longitudinal behavioral effects of a school-based fruit and vegetable promotion program. *Journal of Pediatric Psychology*, E pub May 13, 2009 doi:10.1093/jpepsy/jsp041.
- Kloppenborg, J., Wubben, D., & Grunes, M. (2008). Linking the land and the lunchroom: Lessons from the Wisconsin homegrown lunch project. *Journal of Hunger and Environmental Nutrition*, 3, 440-455.
- Knai, C., Pomerleau, J., Lock, K., & McKee, M. (2006). Getting children to eat more fruit and vegetables: A systematic review. *Preventative Medicine*, 42, 85-95.
- Krome, M. (2009, May 28). Children plant carrots and democracy. *The Capital Times*. Retrieved June 15, 2009, from <http://www.madison.com/archives/read.php?ref=/tct/2009/05/28/0905280246.php>.
- Lefebvre, J. (2007, July). A greenprint for healthy kids. *Food Management*. Retrieved June 1, 2009, from http://login.food-management.com/wall.aspx?ERIGHTS_TARGET=http%3A%2F%2Ffood-management.com%2Ffm_innovator%2Ffm_imp_17369%2Findex.html.

Lorson, B. A., Melgar-Quinonez, H. R., & Taylor, C. A. (2009). Correlates of fruit and vegetable intakes in US children. *Journal of the American Dietetic Association, 109*, 474-478.

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

Morris, J. L., & Zidenberg-Cherr, S. (2002). Garden-enhanced nutrition curriculum improves fourth-grade school children's knowledge of nutrition and preferences for some vegetables. *Journal of the American Dietetic Association, 102*, 91-93.

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

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

Peterson, E. (2008, September). *Heats on: Report analyzes gap in school lunch funding*. Retrieved June 15, 2009,

from www.schoolnutrition.org/Blog.aspx?id=10348&blogid=564&terms=school+lunch+funding.

Robinson-O'Brien, R., Story, M., & Heim, S. (2009). Impact of garden-based youth nutrition intervention programs: A review. *Journal of the American Dietetic Association, 109*, 273-280.

Severson, K. (2004, August 29). Food joins academic menu in Berkeley school district. *San Francisco Chronicle*. Retrieved June 15, 2009, from <http://www.sfgate.com/cgi-bin/article.cgi?file=/chronicle/archive/2004/08/29/MNG8T8FL1C1.DTL%20>.

BIOGRAPHY

Oxenham is a Nutrition Consultant for San Francisco Perinatal Associates, Inc. in San Francisco, CA. **King** is an assistant editor for the Journal of Child Nutrition and Management.