

School Gardens in Iowa: Raising More than Just Food

Jenna Ladd

May 2014

The Iowa Policy Project

20 E. Market Street, Iowa City, Iowa 52245

(319) 338-0773

www.IowaPolicyProject.org

Authors and Acknowledgments

Jenna Ladd is a research intern at Iowa Policy Project. She is an undergraduate student pursuing a B.A. in Sociology at the University of Iowa, where she works to promote sustainable policy change on campus and in the larger Iowa City community with advocacy for innovative policy solutions that can mitigate the effects of climate change. Her main interests are local and sustainable food systems, environmental education and outreach, and inspiring cultural shifts toward a climate-conscious society.

The Iowa Policy Project

Formed in 2001, the Iowa Policy Project is a nonpartisan, nonprofit organization. Its principal office is at 20 E. Market Street, Iowa City, IA 52245.

The Iowa Policy Project promotes public policy that fosters economic opportunity while safeguarding the health and well-being of Iowa's people and the environment. By providing a foundation of fact-based, objective research and engaging the public in an informed discussion of policy alternatives, the Iowa Policy Project advances accountable, effective and fair government.

All reports produced by the Iowa Policy Project are made available to the public, free of charge, via the organization's website at <http://www.iowapolicyproject.org>.

The Iowa Policy Project is a 501(c)3 organization. Contributions to support our work may be tax-deductible. We may be reached at the address above, by phone at (319) 338-0773, by email at ipp@lcom.net, or through other contacts available at our website.



The Iowa Policy Project

20 E. Market St. • Iowa City, Iowa 52245 • (319) 338-0773

www.IowaPolicyProject.org

May 2014

School Gardens in Iowa: Raising More than Just Food

By Jenna Ladd

Teacher and farmer have not always been considered such distinct occupations. In fact, taking an early 20th century visit to nearly any industrialized city schoolyard one would find an educator growing both vegetable crops and future gardeners. Such teachers were termed nature-educators and after the groundbreaking of the first schoolyard garden in 1891, gardening became one of the primary components of education during the time. Students tended their own plots in hundreds of larger cities, giving rise to vibrant green pockets hidden in ashen industrialized areas. Proponents of this schooling method cited moral development, Americanization of new immigrants, improvement of health and environment, and occupational training through hard work as motivators for the initiative. By 1915 the United States government had three different bureaus allocating revenue to school and home gardening programs. A survey that year by the Bureau of Education revealed that 78 percent of city superintendents reported supporting garden programs in some way.¹

Today, school gardens are not as common, yet since the 1980s community and home gardens have gained some popularity.² There are an estimated 18,000 community gardens in the United States and Canada³ and about 43 million households have home gardens, 26 percent of them in the Midwest.⁴ Contemporary gardeners offer similar reasons as nature-educators did for growing their own food including physical and psychological well being, better tasting food, and cost savings on groceries. During many periods of our country's history gardening has been more than just a hobby.

It is the American way to turn to gardens during times of crisis. During the Great Depression land in urban areas was given to the impoverished and jobless. In New York City alone citizens facing hard times cultivated over 5,000 gardens on 700 acres.⁵ Community gardens offered food security with little need for transportation during and after both the First and Second World War. The community gardens' success inspired the implementation of the Victory Garden Program, a United States Department of Agriculture initiative that led to the creation of about 20 million gardens nationwide,⁶ decreasing a national dependence on imported resources and food shipped from long distances while giving Americans a sense of independence through direct control over calorie production during uncertain times.

Albeit the pressing issues of present day differ greatly from those in the past, school gardens may still be part of the solution. American young people weigh more than ever before, and many of them lack access to healthy sources of calories. Communities across the country are already dealing with the backlash of climate change caused in part by unsustainable agricultural methods. Efforts to keep students interested and in school continue to prove challenging. School gardens are a low-cost, effective way to educate our youth about healthy food choices, foster local food systems while preserving natural resources, and to keep students engaged with proven

experiential learning techniques. Although some support exists for these programs in Iowa in the form of private and government grants, school gardens can make a strong case to receive more of our policymakers' attention.

Developing Healthy Lifestyle Choices

With more than one third of the children and adolescents in the United States considered overweight or obese, obesity is a grave epidemic facing the current generation.⁷ Obesity-related health costs in the United States are \$190.2 billion annually, with childhood obesity accounting for \$14 billion of the total figure.⁸ Experts have developed a simple rule to lower these staggering statistics that is promoted by federal and state governments known as the 5-2-1-0 guideline.⁹ The most important components of this rule as they pertain to school garden spaces are that children should consume at least five servings of vegetables or fruits daily and partake in at least one hour of physical exercise per day. Additionally, the two stands for less than two hours of screen time per day, and the zero means that experts recommend not consuming any sugary soda or juice-type drinks. The development of the aforementioned healthy lifestyle choices should begin during childhood as most personal food and exercise habits are established by age 15.¹⁰ As straightforward as the 5-2-1-0 guideline may seem, many students face socio-economic barriers to health such as the inability to purchase fresh produce, inadequate nutrition education, and unsafe outdoor spaces in which they can exercise. The introduction of school gardens to Iowa's schoolyards offers a powerful tool in the fight against obesity through providing exposure and access to fresh vegetables and fruits, and increased opportunities for youth to participate in physical activity.

A primary benefit of schoolyard gardens is the direct connection to whole, healthful foods these spaces offer to students. In part because of a lack of access, a distressing 9 percent of children in the United States consume the recommended five servings of produce daily.¹¹ Studies of community gardens demonstrate that individuals who garden consume more vegetables and fruits than those that do not. Students with access to community gardens also consume more produce and fewer fatty and sugary foods.¹² The increased exposure that growing food can offer is necessary, especially for picky eaters, as most children need to taste a food 10-15 times before enjoying it.¹³ A study by Lineberger and Zajicek¹⁴ used a simple pretest-posttest method to evaluate the impact school gardens had on students' attitudes and behavior regarding fruits and vegetables. The study collected pretests and posttests from 111 third- through fifth-grade students before and after completing 10 chapters of a prescribed garden curriculum authored by the researchers and partaking in the accompanying garden activities. The evaluations were divided into three sections, the first testing children's opinion about 17 commonly consumed vegetables and the second regarding 13 commonly consumed fruits. Both sections utilized a simple scale: 2=I like this a lot, 1=I like this a little, and 0=I do not like this. The final section asked the sample population to choose their preferred snack between a fresh fruit or vegetable and a non-produce option such as ice cream. Students who chose the healthier option received one point; therefore the mean for this portion is expressed on a scale from 0-1.

Table 1. Vegetable and Snack Preference Before and After Gardening

Group	Students (n)	Mean Score	Standard Deviation
Vegetable Preference			
Pretest	111	.979	.419
Posttest	111	1.046	.394
Snack Preference			
Pretest	111	.395	.284
Posttest	111	.456	.271

**Statistically significant at P>.04 in t test comparison*

As demonstrated, children reported that they liked vegetables more than they had before participating in the garden project. In contrast, the reported attitudes toward fruits did not change significantly. This is likely explained by the cost and permanent nature of fruit trees and bushes that pose difficulties for many school garden programs. Additionally, students were much more likely to choose vegetables and fruits as a snack in the posttest. All positive impacts were more significant among third-graders vs. fifth-graders, suggesting that educational garden programming should begin sooner rather than later. While involvement in gardening from a young age is important, it is not necessary for schools to make a large time commitment in order to change what the next generation decides to put on its plate. In fact, only 30 minutes a week in the garden has proven to increase students' willingness to try new vegetables.¹⁵ Being exposed to new vegetables for the first time when they are at the peak of their freshness and harvested from nearby soil may encourage students to continue eating well. Tammy Stotts, Iowa Department of Agriculture Farm-to-School coordinator, explains, "There's a difference in what kids will eat based on whether or not it's locally grown."¹⁶ Schoolyards are about as local as one can get.

As mentioned, gardening is a twofold approach to holistic health and weight management for youth. Working in the garden serves as a means to educate through experience about healthful eating and nutrition as well as a location in which students can safely partake in productive physical exercise. Researchers in South Korea¹⁷ sought to determine the metabolic cost of 10 gardening tasks through monitoring 17 children, all aged 12 and with a Body Mass Index of 21.6 ± 0.4 . The subjects visited the research garden on two separate occasions, completing five gardening tasks both times; each child wore a portable calorimeter and a heart rate monitor. The children performed each garden chore for five minutes with a five-minute resting period between. The researchers reported that sowing seeds, mulching, harvesting, watering, mixing growing medium, planting transplants, weeding, and hoeing were all moderate intensity exercises. Both digging and raking were measured as high-intensity exercises. The metabolic equivalents (MET) of this study confirm that garden-based exercise for children can support a physically active lifestyle. A second study highlighted the positive impact available garden spaces have on the physical fitness of school-aged children. Researchers selected a cohort of 2,064 children ages 9 and 10 and attached a GPS and an accelerometer, a device measuring rates of acceleration, to each participant. The children wore the devices for four consecutive days. Researchers recorded the geographic locations of bouts of physical activity lasting more than five minutes. The results showed children are more likely to perform physical activity when in a garden than in any other place-including parks, woodland areas, farmland, and paved areas. In fact, the selected population was 10.4 percent more likely to be physically active in a garden than a park area and 5.1 percent more likely in a garden than on roads and paved areas.¹⁸ Drawing from this study, one can safely conclude gardens encourage physical activity in children more than most other types of land use. Dedicating a larger portion of schoolyard acres to a landscape that fosters physical fitness in youth is a step that makes sense.

Supporting Stronger Academic Performance

A nutritious diet rich in fruits and vegetables must not be considered in isolation from a child's academic success. Inadequate vegetable and fruit consumption is linked with poorer academic performance.¹⁹ A largely untapped potential lies in employing school garden spaces as mechanisms to teach nearly every core subject, and to perhaps even teach them more effectively than traditional methods. Gardens offer students a way implement problem-solving strategies and use critical thinking skills in a real world setting. These skills are believed to be most effectively developed using place-based, experiential learning that involves real world expository practice.²⁰

Eighty-three percent of the U.S. population lives in urban and suburban areas and therefore could be lacking the direct, sensory contact experts believe is necessary for cognitive development in children.²¹ A comparative study of 40 schools from across the United States found schools that integrated the natural environment into curriculum had higher grade point averages, standardized test scores, and overall interest in learning in 92 percent of comparisons.²²

Evidence supporting school gardens' capacity to improve academic performance applies to children of all socioeconomic and racial backgrounds. In fact, minority children of lower socioeconomic standing have been among the most studied demographic in this area of research; plant-based education has been shown to improve standardized testing scores in language arts, math, science, and social studies of both higher and lower socioeconomic populations.²³ The improvement of all students' understanding in a variety of subjects as a result of garden-based education programs is not uncommon. In all, 12 major quantitative studies have been performed assessing the standardized test scores of children involved in garden-based education programs vs. those who are not. The results are expressed as $>.05$ for significant effects, nine of the 12 studies saw significantly higher test scores in all core subjects. All 12 studies reported significantly higher test scores in science.²⁴

Of course, numbers alone cannot adequately depict all of the ways school gardens enhance education for pupils. For this reason, many researchers turn to qualitative evidence offered by students, parents and teachers who are directly involved in garden operations. Mike Loots, a garden organizer and teacher at Northwest Junior High in Coralville, explains, "Gardens are so valuable in schools. They offer students and teachers real, responsive case studies on human beings' impacts on natural systems. To understand the multiple interplays of soil, sun, water and food — that is to say living things — one must delve deep into the heart of issues that cross all curricula. Gardens enliven concepts that otherwise might run the risk of feeling dead on the page of a text book."²⁵ Educators at over 322 schools in the United States participating in the National Gardening Association grant program share in Loots' sentiments, with fewer than 5 percent of respondents reporting they felt student gardens were ineffective in enhancing students' learning.²⁶ A report aiming to summarize and compare the seven primary, qualitative studies regarding this topic found that all seven studies noticed that students were excited by exploratory learning in the garden and demonstrated improved school attitude and pride.²⁷ As a state, Iowa should continually utilize the most innovative and effective educational approaches possible, experiential learning through garden education has earned a position among the leading learning strategies available.

Encouraging Environmental Stewardship

Surprising as it may be, it is not unrealistic to say that a meal from an Iowa school garden may be the only meal some children consume that was grown in Iowa soil during their lifetime. While the majority of land in Iowa is used for agriculture, humans directly consume very little of it. Iowa is a leading producer of corn and soybeans, but these crops are primarily used to feed livestock. Iowa's heavy dependency on fruits and vegetables grown elsewhere harms ecological health. On average, produce purchased by Iowans has traveled around 1,500 miles to grocery store shelves.²⁸ The daily pilgrimage of food from field to processing plants to supermarket is estimated to account for 17-20 percent of the United States' fossil fuel consumption.²⁹ Growing even a portion of the lunches consumed by the 480,000 public school students in Iowa on schoolyard soil would lessen the state's carbon footprint.³⁰ Aside from greatly reducing the fossil fuels necessary to transport calories, the increased biodiversity that gardens bring to schoolyards is environmentally advantageous. Increasing plant diversity in an area of land allows that space to offer more

ecological services. These services include reducing water runoff into local waterways, providing a home to already endangered pollinators like bees, and carbon sequestration.³¹ Materials typically used in schoolyards such as asphalt and concrete are impervious surfaces from which contaminated water can easily run off. The root systems of plants not only filter this water but also slow its return to main waterways, preventing floods.

Additionally, school gardens have been known to encourage environmental stewardship among participants. Adults who had significant experience in nature during childhood under the supervision of teachers or adults are significantly more likely to be environmentally concerned and active.³² There is a fair amount of quantitative evidence on this topic, one study of 654 third-through fifth-grade students found that children had improved environmental awareness and attitudes after participating in any gardening, even if they were not part of a specific garden curriculum.³³ A separate study performed by the Iowa State Extension Office surveyed the parents of 78 first-graders. Parents reported that their children's environmental attitudes had improved after gardening according to four criteria including an increased respect for landscapes, a heightened awareness of environmental issues as demonstrated by conserving water, picking up litter, etc., an increased interest in the care of plants, and a more enthusiastic interest in gardening.³⁴ Garden access can provide what children are missing: a direct personal experience with nature they need to have a real understanding of environmental issues.³⁵ Due to safety concerns in their neighborhoods, the inability to access a natural play area, or an increased tendency for children to spend more time with electronics indoors, many children are kept separate from the natural world. Gardens can help students overcome these obstacles.³⁶

Experiential education, such as that taught in the garden, provides children with the opportunity to actually carry out environmental actions, aiding greatly in the cultivation of a generation of environmentally minded individuals.³⁷ The health of ecological systems affects everyone on Earth; all citizens regardless of socioeconomic level, race, or geographic location should have the opportunity to understand and advocate for the health of the planet. The public education system can serve as a place for all to learn through experience about where food comes from, and how to be a responsible consumer of it.

What Iowa Does — Current Policy

Educators, community volunteers and parents across Iowa understand what school gardens can do for their children and have taken action. In addition to privately funded grant programs, the state of Iowa has allocated funds to aid schools in starting up their garden plots. The Iowa Department of Agriculture's program to fund school gardens is called "A Garden is the Way to Grow"; it has been in existence since 2012 and has served over 40 Iowa schools. For the 2014 application cycle, the initiative will provide a watering wand, soaker hose, stirrup hoe, an identification guide for insects and weeds as well as diseases, a hand pollinator, a low tunnel with row cover, and \$150 for other associated costs to chosen applicants.³⁸

Critiques of the local, whole foods movement have asserted that groups with limited socioeconomic resources are either excluded from, or have unequal access to nutritious and sustainable food systems.³⁹ While Figure 1 reveals that state-funded school garden programs are not evenly distributed throughout the state of Iowa, a further look into the median incomes by county reveals that the number of state-funded garden programs per county does not appear to be directly related to income. The bottom quartile in terms of income has 11 state-funded school garden programs while the 25 wealthiest counties in Iowa have 15.⁴⁰ The presence of five additional gardens in the wealthiest counties is likely a reflection of the higher populations in

these areas. We recognize counties can vary greatly in terms of income, but a median income figured for each area seemed the most appropriate data available for our purposes. Based on these findings, it is safe to assume that a county's income likely does not determine the prevalence of state-funded school gardens within that area.

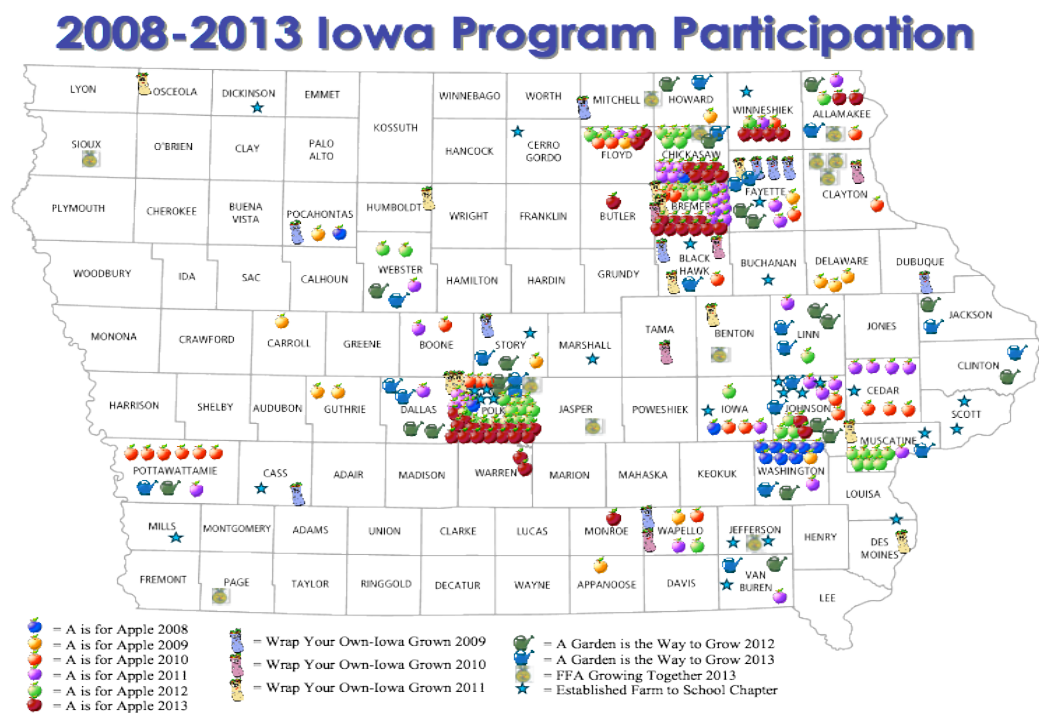
The most commonly cited obstacle in the implementation of school gardens is time. In one evaluative review of school gardens, nearly 70 percent of teachers and administrators said that a lack of time was their primary trouble in starting and maintaining a garden space.⁴¹ This is a possible explanation for the absence of student-grown gardens in some parts of Iowa. Mike Loots asserted: "Gardens take a lot of time, and without ... a full-time gardener position I have to figure out how to persuade students, other teachers, volunteers ... to care about this project as much as I do." Many teachers are stretched for time as it is; funding a paid position or offering a stipend to a garden coordinator has been shown to be a successful way to sustain student garden programs and increase teachers' willingness to incorporate gardens into their lesson plans.⁴²

As it stands, the Iowa Department of Education supplies links to information about the "A Garden is the Way to Grow" grant program, garden curriculum resources, and a school garden webinar given by Food Corps on its webpage.⁴³ The Iowa Department of Agriculture's "A Garden is the Way to Grow" grant program is reaching more of Iowa's students every year, but the state as a whole can do more. Upon clicking on the other resource links on the website related to school gardens, users are instantly redirected to the United States Department of Agriculture website. Although the federal government's support is valued, support for these programs coming from within the state are limited yet necessary. The existence of many school gardens rely solely on the drive of a teacher or community member who understands what these spaces can do — not only for youth, but for the state as a whole. Educators advocating for the health and education of their students must often turn

to privately funded grants from NGOs and private supporters.

The state of Iowa should recognize the health, academic and environmental benefits of student gardens and take real steps to ensure their successes.

Figure 1. Iowa Participation in USDA Farm to School Programs is Unbalanced Statewide



*Garden programs indicated by blue and green watering cans termed, "A Garden is the Way to Grow."

What Iowa Could Do — Policy Recommendations

We recommend Iowa's policymakers allocate revenue to funding stipends for educational garden supervisors at public schools. On average, a sport or activity sponsor makes anywhere from \$1,000-\$6,000⁴⁴ a year depending on the school district and the nature and time commitment of the activity being sponsored. Funding for paid positions should be considered in tandem with the fact that school gardens have the capacity to pay for themselves. Anecdotal evidence shows that gardens can significantly increase the property value for neighbors closest to them. In Milwaukee, properties within 200 feet of a community garden showed increased property value of \$24.77 per square foot, and each garden returned \$9,000 to the city each year in tax revenue.⁴⁵ School gardens can be profitable when managed correctly. According to the Iowa State Extension Office, a vegetable garden growing six to 10 different vegetables for a 20-week season has the potential to earn a gross income of \$8,000-\$10,000 per acre selling to K-12 grade schools.⁴⁶ Even with less than an acre, gardens could save school districts a significant amount of money on school lunches while also ensuring that meals are meeting mandated nutritional guidelines for produce consumption. Given current data on the topic, the payment of a sensible stipend to garden sponsors would be an economically prudent step for policymakers.

We recommend that the state of Iowa provide a \$500,000 pilot project to pay for garden organizers' stipends at 400 Iowa schools. Each stipend would be \$1,000 for the year, with an additional \$250 for each school to be used for starting costs including seed, compost, tools and more. We suggest selecting recipient schools based on population density. Schools would be categorized as urban, rural or "other." Schools considered in the "other" category would be those that lie somewhere between an urban and rural-type institution. This would help ensure that students from various backgrounds are included. The definition of urban here would be relative to the overall population density of Iowa. Cities with a population greater than 50,000 would be considered urban, those with a population of 7,000 citizens or less would be considered rural, and all those remaining would be considered "other." Selected garden organizers could be teachers, administrators, involved parents, or community members. All chosen applicants would be subject to background checks. We propose the pilot project to last one year. The continuation of funding should be determined by comprehensive surveys completed by garden sponsors, administrators and students after the first year. Surveys would evaluate academic progress made by students, economic return to participating schools, and overall community response to the programs.

The advantages of experiential environmental education and healthy food are clear and necessary for Iowa's next generation. Without the implementation of community and school gardens, eating whole, organic fruits and vegetables becomes a luxury of the upper-middle and upper class. Almost 414,000 Iowans were purchasing food using the Supplemental Nutrition Assistance Program, or "food stamps," at the end of 2013,⁴⁷ and 12.8 percent of Iowa's children are living in poverty.⁴⁸ In the struggle to provide sufficient calories, many families turn to cheap and processed foods. These foods are often high in empty calories and contain high amounts of fat and sugar. While the highest-quality foods may be unattainable to a large part of Iowa's population in supermarkets, it can be available to all children directly from the soil at school for a fraction of the cost. Children consume 19-50 percent of their daily calories at school. Iowa policy needs to make sure that those calories count in terms of nutrition, education and sustainability.

Notes

- ¹ Trelstad, Brian, "Little Machines in Their Gardens: A History of School Gardens in America, 1891 to 1920." *Landscape Journal*, February 28, 1997. <http://lj.uwpress.org/content/16/2/161.abstract>
- ² Trelstad, Brian, "Little Machines in Their Gardens: A History of School Gardens in America, 1891 to 1920." *Landscape Journal*, February 28, 1997. <http://lj.uwpress.org/content/16/2/161.abstract>
- ³ "Frequently Asked Questions," American Community Gardening Association. <https://communitygarden.org/resources/faq/>
- ⁴ "Infographic: Home Gardening in the United States," National Gardening Association, June 6, 2011. <http://www.mnn.com/your-home/organic-farming-gardening/stories/infographic-home-gardening-in-the-us>
- ⁵ Hynes, H.P., "A Patch of Eden, America's Innercity Gardeners." Chelsea Green Publishing Company (White River Junction, Vermont): May 1996.
- ⁶ Murphy, R. "Keeping a Good Thing Going, A History of Community Gardening in the U.S.," *Green-Up Times*, Newsletter of the NY Botanical Garden's Bronx Green-Up Program, 1991.
- ⁷ "Childhood Obesity Facts," United States Center for Disease Control, February 27, 2014. <http://www.cdc.gov/healthyyouth/obesity/facts.htm>
- ⁸ "Economic Cost of Obesity," National League of Cities. <http://www.healthycommunitieshealthyfuture.org/about-us/the-national-league-of-cities/>
- ⁹ "Healthy, Active Living for Families," American Academy of Pediatrics, May 11, 2013. <http://www.healthychildren.org/English/healthy-living/nutrition/pages/Healthy-Active-Living-for-Families.aspx>.
- ¹⁰ DiNubile, N.A., "Youth Fitness Problems and Solutions," *Preventative Medicine*. <http://www.ncbi.nlm.nih.gov/pubmed/8415512>
- ¹¹ Charles, C., et.al., "An Exploration of Children's Experiences with the Outdoors and Nature with Associated Risks and Benefits," *Child & Nature Network Worldwide*, 2012. <http://www.childrenandnature.org/documents/C118/>
- ¹² Somers, Shawn, et.al., "School-based Community Gardens: Reestablishing Healthy Relationships with Food," *Journal of Home Economics Institute of Australia* 12.2, 2005. <http://research-hub.griffith.edu.au/display/n3b3a0272e9d44d0760b1dc21398dd4a6>
- ¹³ "How to Handle Picky Eaters," *Zero to Three: National Center for Infants, Toddlers, and Families*. <http://www.zerotothree.org/child-development/health-nutrition/how-to-handle-picky-eaters.html>
- ¹⁴ Lineberger, Sarah; Jayne M. Zajicek, "School Gardens: Can a Hands-on Teaching Tool Affect Students' Attitudes and Behaviors Regarding Fruits and Vegetables?" *Hort Technology*, July-September 2000. <http://horttech.ashspublications.org/content/10/3/593.abstract>
- ¹⁵ Cason, K., "Children are 'Growing Healthy' in South Carolina," *Journal of Nutrition Education and Behavior*, July 1999. [http://www.journals.elsevierhealth.com/periodicals/jned/article/S0022-3182\(99\)70446-2/](http://www.journals.elsevierhealth.com/periodicals/jned/article/S0022-3182(99)70446-2/)
- ¹⁶ Tammy Stotts, personal interview, 7 March 2014.
- ¹⁷ Park, Sin-Ae, et.al. "The Metabolic Cost of Gardening Tasks in Children," *Hort Technology* 23.5, 2013. <http://horttech.ashspublications.org/content/23/5/589.full.pdf>
- ¹⁸ Jones, Andrew, et.al. "Environmental Supportiveness for Physical Activity in English Schoolchildren: A Study Using Global Positioning Systems," *International Journal of Behavioral Nutrition and Physical Activity* 6.42, 2009. <http://www.ijbnpa.org/content/6/1/42>
- ¹⁹ Florence, Michelle, Mark Asbridge, and Paul Veugelers. "Diet Quality and Academic Performance," *Journal of School Health* 78.4, 2008. <http://onlinelibrary.wiley.com/doi/10.1111/j.1746-1561.2008.00288.x/full>
- ²⁰ Culin, Joe. "Butterflies Are Great Teachers: The South Carolina Butterfly Project," *American Entomologist*, 2002. <http://eurekamag.com/research/015/190/butterflies-great-teachers-the-carolina-butterfly-project.php>
- ²¹ Thorp, Laurie and Christine Townsend. "Agricultural Education in an Elementary School: An Ethnographic Study of a School Garden," *National Agricultural Education Research Conference*, 2001. <http://aged.caf.wvu.edu/Research/NAERC-2001/thorp.pdf>
- ²² Lieberman, Gerald and Linda Hoody. "Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning," *State and Educational Roundtable*, 1998. <http://www.seer.org/pages/GAP.html>
- ²³ Blair, Dorothy. "The Child in the Garden: An Evaluative Review of the Benefits of School Gardening," *The Journal of Environmental Education*, 2009. <http://www.csupomona.edu/~smemerson/business318/articles101/childrens%20gardens.pdf>
- ²⁴ Blair, Dorothy. "The Child in the Garden: An Evaluative Review of the Benefits of School Gardening," *The Journal of Environmental Education*, 2009. <http://www.csupomona.edu/~smemerson/business318/articles101/childrens%20gardens.pdf>
- ²⁵ Mike Loots, personal interview, 23 March 2014.
- ²⁶ Demarco, L.W., et.al. "Integrating Garden into Elementary School Curriculum," *Hort Technology*, 1999. <http://horttech.ashspublications.org/content/9/2/276.full.pdf>
- ²⁷ Blair, Dorothy. "The Child in the Garden: An Evaluative Review of the Benefits of School Gardening," *The Journal of Environmental Education*, 2009. <http://www.csupomona.edu/~smemerson/business318/articles101/childrens%20gardens.pdf>
- ²⁸ Pirog, Rich, Timothy Van Pelt, et.al. "Food, Fuel, and Freeways: An Iowa Perspective on How Far Food Travels, Fuel Usage, and Greenhouse Gases," *The Leopold Center for Sustainable Agriculture*, 2007. <http://www.leopold.iastate.edu/pubs-and-papers/2001-06-food-fuel-freeways>
- ²⁹ Blair, Dorothy. "The Child in the Garden: An Evaluative Review of the Benefits of School Gardening," *The Journal of Environmental Education*, 2009. <http://www.csupomona.edu/~smemerson/business318/articles101/childrens%20gardens.pdf>
- ³⁰ "Enrollment Summary by District," Iowa Department of Education. <https://www.educateiowa.gov/documents/school-district-certified-enrollment/2014/01/2013-2014-certified-enrollment-summary-0>

-
- ³¹ Aronson, James, et.al., "Ecological Restoration: A New Frontier for Nature Restoration and Economics," *Journal for Nature Conservation*, 2006. [http://repository.up.ac.za/bitstream/handle/2263/5809/Aronson_Ecological\(2006\).pdf?sequence=1](http://repository.up.ac.za/bitstream/handle/2263/5809/Aronson_Ecological(2006).pdf?sequence=1)
- ³² Blair, Dorothy. "The Child in the Garden: An Evaluative Review of the Benefits of School Gardening," *The Journal of Environmental Education*, 2009. <http://www.csupomona.edu/~smemerson/business318/articles101/childrens%20gardens.pdf>
- ³³ Aguilar, O.M., et.al. "Growing Environmental Stewards: The Overall Effect of a School Gardening Program on Environmental Attitudes and Environmental Locus of Control of Different Demographic Groups of Elementary School Children," *Hort Technology*, 2008. <http://horttech.ashspublications.org/content/18/2/243.abstract>
- ³⁴ Hilgers, Kimberly, Cynthia Haynes, and Joanne Olson. "Assessing a Garden-based Curriculum for Elementary Youth in Iowa: Parental Perceptions of Change," *Hort Technology*, 2008. <http://horttech.ashspublications.org/content/18/1/18.full>
- ³⁵ Hudson, Stewart. "Challenges for Environmental Education: Issues and Ideas for the Twenty-first Century," *Bioscience*, 2001. <http://bioscience.oxfordjournals.org/content/51/4/283.full>
- ³⁶ "Screen Time and Children," *Medline Plus*, 2011. <http://www.nlm.nih.gov/medlineplus/ency/patientinstructions/000355.htm>
- ³⁷ Hudson, Stewart. "Challenges for Environmental Education: Issues and Ideas for the Twenty-first Century," *Bioscience*, 2001. <http://bioscience.oxfordjournals.org/content/51/4/283.full>
- ³⁸ "2014 A Garden is the Way to Grow," Iowa Department of Agriculture, 2014. <http://www.iowaagriculture.gov/AgDiversification/farmToSchoolProgram.asp>
- ³⁹ Caraher, Martin, Paul Dixon, Tim Lang, Roy Carr-Hill. "Barriers to Accessing Healthy Foods: Differentials by Gender, Social Class, Income, and Mode of Transport," *Health Education*, 1998. <http://hej.sagepub.com/content/57/3/191.short>
- ⁴⁰ "Median Household Income," Iowa Workforce Development News and Trends, 2013. <http://www.iowaworkforce.org/trends/mediana.html>
- ⁴¹ Blair, Dorothy. "The Child in the Garden: An Evaluative Review of the Benefits of School Gardening," *The Journal of Environmental Education*, 2009. <http://www.csupomona.edu/~smemerson/business318/articles101/childrens%20gardens.pdf>
- ⁴² Graham, H., S. Zidenberg-Cherr. "California Teachers Perceive School Gardens as an Effective Nutritional Tool to Promote Healthful Eating Habits," *Journal of American Dietetic Association*, 2005. <http://www.ncbi.nlm.nih.gov/pubmed/16256767>
- ⁴³ Food Corps is an Americorps service partner organization. Corps members serve for a year in underserved areas of the United States teaching children about healthy food, building and maintaining gardens, and working to bring better foods into public school cafeterias. <https://foodcorps.org/about>
- ⁴⁴ Stipend range was based the average stipends listed in job openings for coaching and activity sponsor positions at Iowa public schools. Five schools' job openings were averaged from four regions of the state and then averaged. Many schools did not list possible stipends in the job descriptions; this range is based on stipends listed.
- ⁴⁵ Bremer, A., K. Jenkins, and D. Kanter, "Community Gardens in Milwaukee: Procedures for Long-term Stability and Their Importance to the City," Department of Urban Planning, University of Wisconsin. http://www.gardeningmatters.org/sites/default/files/Multiple%20Benefits_2012.pdf
- ⁴⁶ "Selected Alternative Agricultural Financial Benchmarks," Iowa State Extension Office, 2012. <http://www.extension.iastate.edu/agdm/wholefarm/html/c3-65.html>
- ⁴⁷ "Supplemental Nutrition Assistance Program: Number of Persons Participating," USDA: Food and Nutrition Service, 2014. <http://www.fns.usda.gov/pd/29snapcurrrpp.htm>
- ⁴⁸ "By the Numbers: Childhood Poverty in the U.S.," *Frontline*, 2012. <http://www.pbs.org/wgbh/pages/frontline/social-issues/poor-kids/by-the-numbers-childhood-poverty-in-the-u-s/>