

Gardening Programs in Schools: A Case Study of Nutrition and Food Education at Mt. Diablo High School

Wendy Chen

Abstract Children and adolescents consume and prefer junk foods over fruits and vegetables. These habits can lead to future health problems, like diabetes, stroke and cardiovascular disease. Despite the benefits of eating fruits and vegetables, many children do not consume recommended amounts because of their food preferences, which are learned through environments like the school and home. Previous studies have shown the benefits school gardening programs can have on elementary school children's knowledge, preference and intake of fruits and vegetables. However, no similar studies have been conducted among high school students. My research question was: does participation in a high school gardening program increase high school students' preferences of fruits and vegetables? My hypothesis was that high school students who participate in a school gardening program would demonstrate an increase in their knowledge and intake of vegetables and fruits compared to nonparticipants. I conducted my study in an 11th grade Health and Biosciences class at Mt. Diablo High School in Concord, California. I attempted to interview the entire class, both participants and nonparticipants, using a semi-structured interview. Analysis was conducted using coding and qualitative content analysis and yielded major themes including parental influences: food options offered at school, and lack of nutrition education in the classroom. However, these themes show support for the null hypothesis: there were no increases in participants' knowledge, preference, and intake of fruits and vegetables compared to nonparticipants. This may be attributed to the lack of integration of the gardening program into the curriculum and the lack of healthy alternatives at school.

Introduction

Childhood and adolescent nutrition is becoming an increasingly important issue in American schools and homes as the prevalence of childhood obesity has significantly increased over the past two decades (Hedley *et al.* 2004). Diehl (1999) showed that adolescents from the ages of 10-14 prefer fast foods, candies and salty snacks to vegetables. Among youth, sedentary lifestyles, along with diets low in fruits, vegetables, and complex carbohydrates, and high in fat can lead to type 2 diabetes, hypertension, and heart disease in adulthood (Lautenschlager and Smith 2007). Studies conducted by Guenther *et al.* (2006) supported the need to increase consumption of a larger variety of vegetables, particularly dark-green leafy, yellow-orange vegetables, and a wide variety of fruits, particularly of citrus and deep-yellow-orange colors. Vegetables and fruits contain high antioxidant levels (Halvorsen *et al.* 2006) and may help to protect against cardiovascular disease, stroke, and other health-related diseases (Genkinger *et al.* 2004). Eating healthy foods like fruits and vegetables during childhood and adolescence promotes optimal childhood health, growth, and intellectual development, and prevents immediate health problems, such as iron deficiency, anemia, obesity, eating disorders, and dental cavities. It may also prevent long-term health problems like coronary heart disease, cancer and stroke (CDCP 1996). Despite the positive role that fruits and vegetables play, the variety of vegetables currently consumed by Americans does not reflect the variety specified in the United States Department of Agriculture's updated food guide pyramid (Guenther *et al.* 2006). The mean intake of starchy vegetables is above recommended levels for most age groups, whereas consumption of dark green vegetables, orange vegetables, and legumes are less than one third of recommended amounts (Guenther *et al.* 2006).

Domel *et al.* (1996) found that food preferences were the only significant predictors of fruit and vegetable consumption, as well as the main predictor of vegetable consumption. Although such preferences have often been thought to be an innate representation of the body's need for nutrients, research indicates that the foods people choose to consume are actually determined by a combination of genetic predispositions as well as early experiences with food (Birch 1999). Food preferences can be learned through experiences with food and eating as well as with repeated exposure to the food item (Pliner 1982).

Because children spend significant amounts of their time in school, the school environment has a powerful influence on students' eating behaviors (Wechsler *et al.* 2000). One way in which schools can expose children to fruits and vegetables is through school gardening programs. Morris *et al.* (2000) found that the visual reinforcement of a school garden reminds 4th grade students participating in such programs about the nutrition lessons that were taught, even during days when the program was not held.

Gardens also increase the availability and accessibility of fresh fruits and vegetables to elementary school students (Morris *et al.* 2000). School gardens not only increase children's exposure to certain fruits and vegetables, but they also increase most students' knowledge about the benefits of eating such foods. According to Koch *et al.* (2006), second through fifth grade students' knowledge about the benefits of eating fruit and vegetables significantly improved after participating in the garden and nutritional program at school. Participants also reported eating healthier snacks immediately after participation in the nutritional program (Koch *et al.* 2006). Such garden programs can increase awareness about the importance of proper nutrition among elementary school students while increasing nutrition knowledge and improving lifestyle choices (Heneman *et al.* 2008). Gardening, along with food preparation, nutrition and physical exercise education has shown to be an effective way to improve kindergarten through 8th grade students' reported vegetable intake and physical activity (Hermann *et al.* 2006). McAleese and Rankin (2007) found that 6th grade students in the gardening programs increased their servings of fruits and vegetables more than the students who were not involved. Sixth graders who participated were also shown to significantly increase their intake of vitamin A, vitamin C, and fiber during and after participation in the garden (McAleese and Rankin 2007).

While there have been many studies that have shown the effectiveness of a gardening program on elementary and middle school children's attitudes, knowledge, eating preferences and intake of fruits and vegetables, no similar studies have been conducted in high schools. There is actually very little information about teens' knowledge and preference for fruits and vegetables. Research shows that gardening programs are able to shape younger children's choices in eating (Heneman *et al.* 2008), but no such similar studies have been conducted with teenagers. It may be that younger students' are more impressionable and likely to make changes to their lifestyles whereas high school students are more ingrained in their habits and choices.

Whatever the causes, studying a school garden's effects on high school students may provide valuable information about the main reasons behind both healthy and unhealthy food choices and how the school and home environment play a role in those choices.

My research question is: Does participation in a school gardening program increase high school students' knowledge, preferences, and intake of fruits and vegetables? Based on previous findings on the effect gardening programs have on elementary school children, my hypothesis is that high school students who participate regularly in a school gardening program will demonstrate an increase in their knowledge, preference and intake of vegetables and fruits compared to nonparticipants. Alternatively, the null hypothesis will show no increase in knowledge, preference or daily intake for students who participate in the garden program compared to students who do not participate.

Methods

Methods and Objectives In order to understand what affects the gardening program had on students' knowledge and preference of fruits and vegetables, I conducted semi-structured interviews with the students, both participants and nonparticipants. This approach allowed me to gather information about the multitude of underlying factors that may have contributed to a student's food preferences (i.e. parental influences, time, convenience, television, friends and peers, etc.). Examples of these questions included: "Has your recognition of fruits and vegetables grown since working in the garden?", "Has the garden affected the way you view food? If so, how?" and "Do you eat fruits and vegetables regularly at home?" (See Appendix for full list of questions) Interviews allowed me to ask a variety of these open-ended questions, and thus I was able to investigate not only *if* the garden program had any influence on the student, but also *why* or *why not* such influences existed.

Identification of system under study I conducted my study at Mt. Diablo High School, located in Concord, California. I interviewed students from one 11th grade Health and Biosciences class, comprised of 23 students. Students in this class had the option of participating in the garden program. Those who chose to participate began working in the garden at the beginning of the school year (September 2008) and will continue to do so until the end of the school year (June 2009). Sandy Shaw, the instructor for the class as well as the corresponding

garden program, explained that a total of 10 students in the entire class chose to participate in the program. None of the students have participated in Mt. Diablo's garden program in previous school years. Interviews took place beginning January 2009 and continued until the end of February 2009.

Data collection and rationale for approach I attempted to interview every student in the class, both participants and nonparticipants, as a comparison for any changes in views, preferences and intake of fruits and vegetables among the two groups. I visited the site twice a week (Mondays and Wednesdays) and interviewed 2-3 students upon each visit. Interviews were conducted during breaks or after school, according to the student's preference and convenience. Every student was initially asked same set of questions, but subsequent questions depended on their previous answers. I would have conducted follow-up interviews if clarification of student responses were needed; however, no such follow-ups were necessary. Interviews were audio-recorded with student and parental permission and I took notes as well. Two students declined to be recorded so I took notes only for these participants. All interviews lasted for roughly 10 minutes. I transcribed each interview the same day that they were recorded.

Techniques of analysis and rationale for approach Interview data was analyzed through systematic coding, the process of grouping interview answers into similar categories. For example, during the process of coding I found that parents influence students' nutrition habits, and I grouped all instances I observed of these types of student responses into a "parental influences" category. Coding allowed me to categorize the interview content based on recurring themes I observed. I began analysis with open coding, which is a first pass through all my transcribed data to observe and select strong and recurring themes or topics (Rubin 1995). Once these skeletal themes were established, I progressed onto selective coding, in which I read through my transcripts several more times to find instances of the themes I established in open coding (Rubin 1995). In the final stages of coding, I established relationships between these differing categories and determined whether or not they influenced or affected each other (Rubin 1995). Coding in this way helped to explain the reasons behind students' food choices and preferences as well as to establish connections and relationships between different influencing factors. When certain topics (ones that I may not have considered in formulating my interview) came up repeatedly, coding increased the likelihood that I would not only take notice of these

themes, but that I would also find a reason behind their frequency as well as their relationship to other topics. Once themes were established through coding, I examined the content of the interview transcripts with qualitative content analysis, which serves to determine relationships and underlying causes for the responses given by the participants.

Results

I was able to interview a total of 18 of the 23 students. Eight of those 18 students participated in the garden while the remaining 10 students had not participated at all. Five students declined to be interviewed. The processes of coding I conducted for the 18 interviews produced five major and recurring themes: enjoyment from participating in the garden, previous gardening experience, parental influences on food habits, school influences on nutrition choices, and a lack of classroom reinforcement for gardening and nutrition. The content analysis for these themes showed evidence in support of the null hypothesis: there was no difference in knowledge, preference or intake of fruits and vegetables for students who participate in the garden and those who do not.

Table 1. Garden program participant and nonparticipant responses

	Participants (8 total)	Nonparticipants (10 total)
Enjoyment in working in the garden	8	N/A
Previous gardening experience/exposure	4	6
Home-cooked meals	7	9
Reported presence and availability of vegetables/fruits at home	8	10
Dislikes school lunches	7	9
Likes school lunches	1	1
Buys lunch at school	4	6
Brings lunch to school	2	1
Skips lunch	2	3

Reported no teaching of topics relating to garden program and/or nutrition	8	10
--	---	----

Enjoyment In Garden Participation Five of the eight students who participated in the garden were motivated by the opportunity to receive extra credit. However, all 8 conveyed enjoyment and appreciation for working in the garden. The majority (6 out of 8) said they would return to the garden or even work there again. One student confessed, “I went there for extra credit cause I did want it, but once I went there I had a lot of fun.” Another student explained: “Oh yeah, it was fun! Like, it was a cool activity. That was the first time yeah, like I ever *worked* in a garden. Yeah, it was a cool activity. Like it was like, nice to be outside, you know.” One girl described the enjoyment she experienced watching her work come to fruition: “I think it’s relaxing. It’s relaxing to just pick out the weeds; Just seeing everything grow, it’s like amazing. It’s like ‘Oh my God, it’s growing!’”

Previous Gardening Experience Ten of the students have had exposure to working in gardens in the past. Some had worked in Riverview Middle School’s garden, the middle school most students attended before entering Mt. Diablo High. Others have worked in the Baypoint Garden, a community garden that offers summer jobs to high school students. “Yeah, I used to work in this garden down at Baypoint. It’s not part of this school, but it’s this program that they have. So yeah, it’s a job.” And several students reported experiences in their own home gardens or family members’ gardens. One student talked about his father’s garden:

“Well at my house my dad has his own little garden. He grows sometimes some onions or some tomatoes. And we also have cactus, Mexican cactus, and we eat those. Put those on the grill. Those are pretty dope. Yeah, he would do some onions and I would just like water them and then I’d help him trim the cactuses and stuff.”

Parental Influences Parental influence on nutritional habits was seen on three different levels: home-cooking, the presence of vegetables and fruits in the home, and verbal encouragement by parents to eat fruits and vegetables. Illustrating an example of home-cooking and the presence of healthy food at home, one student explained, “[My family] tries not to eat out a lot. [My mom] mostly cooks at home.” Another student had similar experiences: “I live

with my Auntie and she cooks almost every night.” However, in those households that did not cook at home as often, vegetables were still present and available. A student whose parents didn’t cook as regularly explained,

“When we get like take-out, we always have a bag of salad. If we have take-out that night, she’ll be like, ‘Well, don’t forget to eat salad.’ Or if we just have regular dinner that night, she says, ‘There’s salad in the fridge so make sure you eat some.’”

All 18 students also reported the presence and availability of vegetables and fruit in their homes. One girl said, “Yeah, we always eat vegetables at dinner time” while another explained, “We have fruit bowls, for whenever we want. It’s always there, and I eat it.” Students also explained that their parents verbally encouraged them to eat fruits and vegetables or discourage them from eating unhealthy junk foods. One girl reported about her parents, “If they see me like eating [chips and cookies] too much, then they’ll step in and be like, you know, ‘You need to watch what you’re eating.’ And so they remind me [to eat vegetables] every once in a while.” Another student remarked about her parents, “Yeah, they always take [chips] away from [me].” (Laughs) “When I’m just like watching TV or something, I just don’t, I don’t mind what I’m eating. They’re like, (makes a gasping noise) “Oh, what are you eating!?””

School Food Choices Unappetizing lunches, perceived unhealthiness of the food choices, convenience factors, and cost were all contributing factors to students’ attitudes toward the food the school provided. Almost all of the students conveyed discontentment with the lunches the school offered. One student said, “I don’t like it. Or at least, I never, I don’t like it, I don’t like it. It’s not that it tastes really good, the majority of the time I don’t like the food so I don’t eat it.” The food choices available at school seem rather unhealthy. One student described the food offered at school: “There’s a line where they always have sandwiches, and there’s a line where they always have pizza. There’s a line where there’s always like cheeseburgers, and hot dogs, and fries.” Her description of the food offered on campus was confirmed by many other students. Several other students also explained that the school sold poptarts and cookies as snacks. Not only is the school’s food seemingly unhealthy and unpleasant-tasting, but the campus also offers few alternatives and/or healthy choices. One student described this lack of availability: “Usually, I’ll just buy a drink or something, cause they don’t really have much to buy here. It’s just like

school lunch, which isn't that great." Another girl explained that she didn't eat healthier because such options were not accessible on campus:

"I would probably choose the fruits and vegetables because I know the other stuff is bad for me and like, I don't dislike fruits and vegetables. They're good, like grapes and all that stuff. So I'd probably choose fruits and vegetables. But I just don't eat them at school is cause it's not available."

Other students explained that they continue to buy from the school because of its convenience. "I usually buy lunch. It's easier because then you don't have to go through the hassle of making it every day." Another reason why students continued to eat the school food is due to lower cost. One student explained, "Yeah, a lot of kids have a free or reduced plan so they get it cheaper." These factors led students to find their own alternatives. One student confessed that he regularly left campus illegally in search of a better lunch elsewhere: "I go out and buy lunch. I don't buy lunch here...we're not [allowed to go off campus]. It's just the food here isn't that great." Another girl explained that she would skip eating lunch altogether: "I don't like the school's lunch. I just wait until I get home, and stuff my face."

Lack of Reinforcement from the Classroom The class from which I interviewed is a Health and Biosciences course. The topics covered in class focus on anatomy and physiology rather than plant bodies, nutrition or gardening techniques that can be later applied to the work in the garden. Several students explained that the topics taught were not related to their eating habits or what they did in the garden. One student said, "[I] didn't really, didn't really, study nutrition that much. It was mostly about like anatomy and physiology type of thing of our bodies: muscles and heart and stuff." Another student concurred, "Just like the body, that's all we learn about. We don't really talk about like, what we eat or anything." The teacher spends very little time teaching about nutrition and gardening. Rather than being a supplementary or complementary addition to the class, gardening is a very disconnected and separate activity.

Discussion

There was no evidence to support my original hypothesis that students who participate in a gardening program would demonstrate increased knowledge, preference and consumption of

fruits and vegetables as compared to nonparticipants. However, the interviews reveal some underlying factors behind the students' food habits. The major themes include parental influences on eating habits, school influences on food choices, and the lack of classroom reinforcement on gardening and nutrition. These factors and influences may have a stronger impact on students' eating habits than just participation alone in a gardening program.

Parental Influences All students reported eating fruits and vegetables regularly at home. Thus, my original hypothesis that participants would consume more fruits and vegetables than nonparticipants was not supported. Almost all the students explained that their parents usually cook home-made food rather than buying fast food or take-out. They described having many fruits and vegetables available. The presence of such food at home can be seen as a form of nonverbal encouragement. Research has shown that parents can play an important role in the formation of food habits and preferences of their children because they influence their children's food choice by making specific foods available, by acting as models for their children, and by their eating behaviors (Hursti 1999). Also, parental fruit and vegetable intakes and their knowledge of the recommended amounts of such foods have a positive association with children's intakes (Blanchette and Brug, 2005). The availability and presence of fruits and vegetables familiarizes students to foods, which makes them more likely to consume them (Pliner 1982). Some students also described receiving explicit verbal encouragement in the form of scolding or gentle reminders. Finally, several students reported having previous gardening experience because of home and outside gardens. The presence of a garden further familiarizes students with growing their own foods, fresh fruits and vegetables, and even organic foods. Not only do these students have the presence of a garden in their own homes, but many of them have helped their parents' plant and harvest food. All these aspects of parental influence are likely to play an important role in how students perceive food as well as what they choose to eat.

School Influences There was no difference in the types of food the garden participants chose to eat at school when compared to what the nonparticipants chose to eat. The majority of both groups purchased lunch at school, which meant that they were offered the same options. There is the possibility that among the students who purchase lunch at school, some choose slightly healthier options (e.g. a sandwich instead of pizza), or that some eat smaller portions of unhealthy food than others. However, all students are still exposed to the same types of

unhealthy foods. As the students reported, it is faster and more convenient to purchase the school lunch. For many students, it is also less costly than bringing lunch from home. 32% of Mt. Diablo High students are eligible to receive free lunches, and 10% receive reduced-priced lunches (Public School Report 2007, elect. comm.) Free or reduced-priced lunches make it cheaper for students to buy lunch from the school. In this way, parental and school influences compete with one another. Although students receive much encouragement at home to eat fruits and vegetables, similar types of encouragement is lacking in school simply because of the absence of healthy alternatives. A study using a nationally representative sample of 395 US public schools in 38 states found that vending machines were present in 97% of high schools and that 79% of high schools with a la carte sales offered low-nutrient energy-dense foods and beverages (Finkelstein 2008).

The Classroom Finally, there is a lack of correspondence between the classroom and gardening program. One reason for the similarity between participants and nonparticipants' fruit and vegetable intake may be due to the fact that the classroom does not serve to reinforce what is taught in the garden. The garden program is more of an "extracurricular". This is further perpetuated by the fact that extra credit was offered for participation. The garden is not treated as an essential component for the class, but simply as a "bonus", something that is not necessarily essential. This lack of integration of the garden with the classroom is explained by Ms. Shaw as its absence of inclusion into the curriculum. Thus she offers extra credit to encourage participation. She explained to me that she would like to integrate the garden more into the class lessons and activities, but there is simply no time and little funding. The students also reported that very little was taught about nutrition, developing eating habits, or even the garden. Rather, the class was centered on anatomy and physiology. If nutrition and gardening were taught in a way that relates very tightly with the activities conducted in the garden, it is very possible that the students participating in the program would be more influenced, perhaps even to the point of being more mindful of what kinds of food they consume at school. Previous research has shown that after the incorporation of a nutrition education program in K-12 curriculums, there was an increase in students' reported intakes of fruits and vegetables, as well as a reduction in total fat intake and serving size of meals (Hakkak 2004).

Past Findings My study has not yielded the same findings as previous research has shown. Those who participated in the gardening program showed no increase in their intake or preference of fruits and vegetables when compared to the nonparticipants. These differences in results could be due to a difference in age and stage of life. Young children are perhaps more impressionable and more willing to try new foods after they learning about them in class. However, high school students have had more time develop their preferences and habits and may be more set in their eating habits because they have a better idea of their likes and dislikes. Evidence for the null hypothesis may also be attributed to high “baselines.” One particular study conducted by O’Brien *et al.* (2006) found that there were no differences in nutrition knowledge scores between or within groups of 4th graders at baseline or at end-program. Both groups, participants and nonparticipants, indicated a high preference for fruit at baseline and end-program. Vegetable preference did not increase over the course of the gardening program for both groups (O’Brien *et al.* 2006). O’Brien’s study sheds some light on my own research because all the students I interviewed also had a high “baseline” in their exposure to fruits and vegetables in the home. As discussed earlier, all students reported the availability of fruits and vegetables in the household, and parents either verbally or nonverbally encouraged them to consume such foods. Because there was such a strong parental influence, it is possible that participation in a garden a few times during the school year did not make much of an impact on these high school students’ food habits.

Broader Implications My findings, although restricted by constraints and limitations, suggest that there may be broader, as well as deeper factors that affect high school students’ diet and nutrition than just the garden program alone. One such factor is the lack of integration of the garden in the school curriculum. An optional gardening program may not be enough to alter students’ eating habits and encourage them to consume more fruits and vegetables unless it is well incorporated into the classroom. As discussed earlier, students are heavily influenced by the options available at home and in the school. Secondly, there is a lack of healthy alternatives available at school. Due to convenience, cost, and lack of healthier choices, students may effectively be “forced” to choose unhealthy options, even if they consume fruits and vegetables at home. The healthy habits developed at home could be offset by the presence of unhealthy food or lack of healthy foods at school. And because students spend such a significant amount of time within the school setting, it is likely to affect what they eat (Wechsler *et al.* 2000).

Study Limitations and Future Research One shortcoming of my study is that it was conducted on a very small population. The students were all of the same grade level and lived in the same geographic location. Another shortcoming of my study was the fact that I conducted one-time interviews, so it was impossible to measure changes over time. Also, all behaviors were self-reported and therefore had the possibility of being biased or inaccurate. I also did not examine the students' actual eating behaviors or the actual food served at school due to time constraints.

Future research may wish to broaden the scope of such a study. It may be interesting to see how a gardening program affects 9th graders or even 12th grade seniors, as well as teens of varying socioeconomic statuses. A longitudinal study may also be helpful, in order to track any changes in eating behaviors over the course of the entire school year. And it would be useful to examine the actual food students consume as well as the exact foods that are offered at the school. Perhaps it would also be fruitful to do a comparison study of a gardening program that *is* well integrated into the curriculum and where the classroom complements the activities conducted in the garden. This kind of study may shed light on whether or not a garden program that is supported by the curriculum is more effective than one that is separate and disjointed from the classroom. Finally, it may be valuable to study a population of students who bring lunches and whether or not these home-lunches are healthier than what the school offers.

Conclusion In summary, I have found that the school gardening program at Mt. Diablo High had little to no effect on students' nutrition and food habits. Those who participated in the gardening program are equally likely or unlikely to consume fruits and vegetables as those who have not participated. The three major contributing factors to the students' food habits are the school, parents, and the class which offers the accompanying gardening program. While parental influences are often positive and encourage the consumption of fruits and vegetables, the school seems to offset these benefits through its lack of appetizing and healthy foods and the accessibility and low cost of such foods. And because the classroom teaches very little about nutrition education or about the garden, it plays a small role in students' eating behaviors. However, if the garden were better incorporated into the classroom, it may have a stronger impact on students' preferences and intake of fruits and vegetables. While some initial findings were made, study limitations and time constraints calls for further and more comprehensive

research into this topic. It would be interesting to investigate how the issues of time and funding directly affect the efficacy of the garden program. Given more consideration as well as integration into the curriculum, the high school gardening program at Mt. Diablo has the potential to become a very educational and beneficial resource for the students.

Acknowledgments

Thank you to Thomas Azwell and Sandy Johnson Shaw for making this project possible. Thank you to the ES 196 facilitators Robin Turner, Gabrielle Wong-Parodi, Tim DeChant and Shelly Cole for their guidance and constructive comments and to the ES 196 class for their support and input.

References

- Blanchette, L., J. Brug. 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.
- Birch, L.L. 1999. Development of food preferences. *Annual Review of Nutrition* 19: 41-62.
- Centers for Disease Control and Prevention. 1996. Guidelines for school health programs to promote lifelong healthy eating. *Morbidity and Mortality Weekly Report* 45: 1-33.
- Diehl, J. M. 1999. Food preferences of 10- to 14-year-old boys and girls. *Schweizerische Medizinische Wochenschrift* 129: 151-161.
- Domel, S. B., J. Baranowski, T. Baranowski, H.C. Davis, S.B. Leonard, W.O. Thompson. 1996. Psychosocial predictors of fruit and vegetable consumption among elementary school children. *Health Education Research* 11: 299-308.
- Education Data Partnership. 2008. <http://www.Ed-Data.k12.ca.us>, accessed October 22, 2008.
- Finkelstein, D.M. 2008. School food environments and policies in US public schools. *Pediatrics* 122: E251-E259.
- Genkinger, J.M., G.W. Comstock, K.J. Helzlsouer, S.C. Hoffman, E.A. Platz. 2004. Fruit, vegetable, and antioxidant intake and all-cause, cancer, and cardiovascular disease mortality in a community-dwelling population in Washington County, Maryland. *American Journal of Epidemiology* 160: 1223-1233.
- Guenther, K., J. Dodd, S. Krebs-Smith, J. Reedy. 2006. Most Americans eat much less than Recommended amounts of fruits and vegetables. *Journal of American Dietetic Association* 106: 1371-1379.
- Hakkak, Reza. 2004. Evaluation of a model for providing nutrition education to K-12 teachers and nurses via a six-month follow-up survey. *Journal of the Federation of American Societies for Experimental Biology* 18: 357.

- Halvorsen B.L., R. Blomhoff, S.K. Bohn, M.H. Carlsen, K. Holte, D.R. Jacobs, K.M. Phillips. 2006. Content of redox-active compounds (ie, antioxidants) in foods consumed in the United States. *American Journal of Clinical Nutrition* 84: 95-135.
- Hedley, A.A., M.D. Carroll, L. R. Curtin, K.M. Flegal, C.L. Johnson, C.L. Ogden. 2004. Prevalence of Overweight and Obesity Among US Children, Adolescents, and Adults. *Journal of the American Medical Association* 291: 2847-2850.
- Heneman, K.M., S. Tarry, S. Zidenberg-Cherr. 2006. A successful nutrition education program in a rural community. *Journal of the Federation of American Societies for Experimental Biology* 20: A1010-A1011.
- Hermann, J.R., S.P. Parker. 2006. After-school gardening improves children's reported vegetable intake and physical activity. *Journal of Nutrition Education and Behavior* 38: 201-202.
- Hursti, Ulla-Kaisa Koivisto. 1999. Factors influencing children's food choice. *Annals of Medicine* 31: 26-32.
- Koch, S., T.M. Waliczek, J.M. Zajicek. 2006. The effect of a summer garden program on the nutritional knowledge, attitudes, and behaviors of children. *Horttechnology* 16: 620-625
- Lautenschlager, L., C. Smith. 2007. Understanding gardening and dietary habits among youth garden program participants using the Theory of Planned Behavior. *Appetite* 49: 122-130.
- McAleese J.D., L.L. Rankin. 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., M. Briggs, S. Zidenberg-Cherr. 2000. School-based gardens can teach kids healthier eating habits. *California Agriculture* 54: 40-46.
- O'Brien, S.A., C.A. Shoemaker. 2006. An after-school gardening club to promote fruit and vegetable fourth grade consumption among fourth grade students: The assessment of social cognitive theory constructs. *HortTechnology* 16: 24-29.
- Pliner P. 1982. The effects of mere exposure on liking for edible substances. *Appetite* 3: 283-290.

Public Schools and Online Education Information. 2007
<http://schools.publicschoolsreport.com/California/Concord/MtDiabloHigh.html>, accessed
May 8, 2009.

Rubin, H.J. and I. Rubin. 1995. What did you hear: data analysis. Pp. 132-142 *In* Qualitative
interviewing: the art of hearing data. Sage Publications, Thousand Oaks.

Steinecke, J. 2007. Annual Report for the School Year. Executive Summary Annual Report.

Wechsler H., J. Collins, M. Davis, R.S. Devereaux. 2000. Using the school environment to
promote physical activity and healthy eating. *Preventative Medicine* 3: S121-S137.

Appendix

Interview Questions

The School Garden

- Have you participated in the garden?
- For how long/how many times?
- What made you decide to participate?
- What kinds of activities do you do in the garden?
- Has the garden affected the way you view food? If so, how?
- Are you more or less likely to consume vegetables and fruits after spending time in the garden?
- Has your knowledge and recognition of fruits and vegetables grown since participating in the garden?
- What is something you have enjoyed from working in the garden?
- What is something you dislike about working in the garden?
- Have you eaten any of the fruits or vegetables that were grown in the garden?
- Are you more, less, or equally likely to eat fruits and vegetables after spending time in the garden?
- Do you think you will ever grow your own food after participating in the garden program?

Personal Habits/food preferences

- What kind of snacks do you eat at school?
- Do you bring snacks from home or buy them at school?
- Do your parents usually cook meals or do they buy prepared food or take-out?
- When your parents cook, what kinds of food do they make? Do they use vegetables? Do they prepare fruit? If so, what kind?
- Do your parents encourage you to eat vegetables/fruits?
- Do they discourage you from eating junk foods?
- Do their opinions influence the snacks you buy at school?

- Do you go out to eat with your friends?
- Where do you go?
- What kinds of food do you buy/order?
- Do you prefer eating fruits and vegetables over cookies, chips and other snacks?
- If you dislike fruits and vegetables, why do you dislike them?
- What fruits and vegetables do you like and why?
- Do your parents ever force you to eat fruits and vegetables?
- Would you eat fruits and vegetables on a regular basis if you were given the choice?
- What do you think about organic foods?
- Do you ever eat organic foods? Why or why not?
- If you were given a preference to eat organic or non-organic fruits and vegetables, which would you prefer?

The classroom

- Have you learned anything from class about nutrition?
- If you have learned about nutrition, fruits, or vegetables in the class, has this information influenced what you have learned in the garden? Does it reinforce what you learn in the garden? Does it make it harder to learn in the garden? Does it have any effect at all?
- What kinds of topics do you cover in class?
- Do the topics covered in class relate to the garden?
- Do you think your experiences in the garden would be more beneficial if topics about food/nutrition were talked about in class?