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Development and Evaluation of a Garden-Enhanced Nutrition Education Curriculum for Elementary Schoolchildren

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ABSTRACT

The purpose of this project was to develop a garden-enhanced nutrition education curriculum and relevant assessment tools that could be used for formal evaluation. The Social Cognitive Theory (SCT) provided the foundation for the objectives, activities, and evaluation. The curriculum was developed for upper-elementary schoolchildren and included nine key nutrition topics. Master gardeners linked each of the nutrition lessons to appropriate gardening activities, which provided students with the opportunity to plant and harvest their own vegetables. Each lesson was field tested in several classrooms until the content and delivery of the material was appropriate. The final lessons consisted of a nutrition lesson, a gardening activity, a family newsletter, and other useful information for teachers.

Assessment tools used in the formal evaluation of the curriculum included a nutrition knowledge questionnaire and a vegetable preference survey. The preference survey asked students to taste six different vegetables, rate their preferences, and answer four questions related to their knowledge of and behavior toward the vegetables. Nutrition and gardening professionals reviewed the lessons and assessment tools for accuracy prior to the formal evaluation.

Three schools participated in the formal evaluation of the curriculum. One school served as a control site and did not receive any nutrition lessons or gardening activities (CO), a second school received only the nutrition lessons and did not participate in any gardening activities (NL), and a third school received both the nutrition lessons and gardening activities (NG). Evaluation took place before the intervention (pre-test), after the intervention (post-test), and six months later (follow-up). This report focuses on selected knowledge and behavior results from the vegetable preference survey. The NG site results demonstrated improvements in knowledge and behavior at post-test and at follow-up.

The garden-enhanced nutrition curriculum described herein is an effective means of teaching nutrition education to elementary schoolchildren. The incorporation of gardening activities further enhanced its effectiveness. The lessons have been linked to applicable California State Content Standards to assist teachers in developing lesson plans to teach core subjects. This program also provides an excellent opportunity for foodservice staff and teachers to work together. Extra fruits and vegetables from the garden can be offered at the school cafeteria. This may lower foodservice costs, as well as provide students with opportunities to try new fruits and vegetables.

INTRODUCTION

Extensive epidemiological evidence suggests that a diet high in fruits and vegetables provides a protective effect against cardiovascular disease and some types of cancer (Block, 1982;

Joshipura et al., 1999; NRC, 1989; Steinmetz & Potter, 1991). As a result, current national health guidelines recommend that individuals who are age 2 or older consume a minimum of five servings of fruits and vegetables each day (National Research Council, 1989; U.S. Department of Agriculture, 1992, 2000).

Over the past decade, the dietary habits of children ages 2-18 have become the focal point of extensive research efforts, primarily because the food intake of children is not consistent with national recommendations. On average, children consume 2.5-3.5 servings of fruits and vegetables each day (Basch et al., 1994; Dennison et al., 1998; Krebs-Smith et al., 1996; Muñoz et al., 1997; Reynolds et al., 1999). Most of these servings come from either fruit juices or fried potato products. This suggests that children should increase the total amount and variety of fruits and vegetables consumed on a regular basis. In addition, there is evidence that younger children may be more responsive to dietary messages than older children (Birch, 1980). Lastly, research suggests that dietary patterns may be established in childhood and persist into adulthood (Kelder et al., 1994; Krebs-Smith et al., 1995). Thus, educators are looking for effective ways to teach children how and why to increase their consumption of a variety of fruits and vegetables.

The classroom provides an optimal setting to reach and have an impact on children with such a message. Most U.S. children attend school regularly, and many consume at least one meal prepared at the school each day (Kennedy & Goldberg, 1995). A review of school-based nutrition education programs concluded that those programs modeled after a theoretical framework were more effective at influencing health-related behaviors (Contento et al., 1995). For school-age children, programs based on the Social Cognitive Theory (SCT) appeared to be the most effective (Lytle & Achterberg, 1995). The SCT is comprised of three interrelated factors: the individual, the environment, and the behavior (Bandura, 1986). This particular theoretical framework is beneficial when working with a younger audience because it recognizes the impact of the environment on a student's ability to learn new behaviors.

Several nutrition education programs have made it evident that it is possible to alter children's behaviors (Domel et al., 1993b; Luepker et al., 1996; Perry et al., 1985, 1988; Resnicow et al., 1992). However, despite progress made in the field of nutrition education, it still is difficult to positively influence children's dietary habits long-term (Morris et al., 2000). An important concept that often is lacking in nutrition education programs is the relationship between nutrition and agriculture. Moreover, while agriculture-based curricula are available in abundance, they have not focused on nutrition information and dietary behaviors. At the time of this study, no well-tested curriculum existed that adequately linked nutrition lessons in the classroom to vegetables growing in the garden at the school.

The objective of this project was to develop an innovative approach to nutrition education that could produce long-lasting beneficial effects. It was critical that the program would lend itself to appropriate evaluation methodologies. The goal of the curriculum was to teach upper-elementary schoolchildren healthy lifestyle habits through a nutrition education program enhanced with supplemental gardening activities. The stages of development, pilot-testing, and formal evaluation are described and will provide the information necessary for future development and evaluation of school-based nutrition and gardening education programs.

METHODOLOGY

The curriculum and assessment tools were tested in classrooms that reflected the demographics of children in the state. During the 1997-98 school year, the ethnic breakdown of schoolchildren in California was as follows: 8.8% African-American (not Hispanic), 8.1% Asian, 40.5% Hispanic or Latino, and 38.8% White (not Hispanic) (CDE, 2000). The schools selected to participate in this project met the following criteria: had students with demographics similar to those of the schoolchildren across the state; resided within a 75-mile radius of the University of California, Davis; and had garden sites readily available for use by teachers.

Evaluation of the literature demonstrated that while several California academic content standards could be met through the use of lessons planned for this curriculum, the 4th-grade standards were the most compatible with the program. Thus, 4th-grade classrooms were chosen as the study population.

Program Development

1. **Curriculum:** The development of this curriculum began with an extensive review of existing nutrition and garden education materials. Materials were reviewed for content and effectiveness. No existing curriculum adequately linked the two topics together within individual sequential lessons. The goal of the new curriculum was to teach students about nutrition by directly linking the lessons to vegetables growing at their school.

   Local master gardeners, affiliated with the University of California Cooperative Extension, reviewed the lessons and suggested appropriate complementary gardening activities for each nutrition lesson. The respective activities included: indoor seed-planting, worm bottles, outdoor seed-planting, weed identification, bug boxes, water and fertilizer garden, seed dispersal, butterflies, and crop harvest. These activities were designed to teach the students about a variety of topics related to their vegetable gardens, such as the benefits of worms for fertilization, while exposing them to the hands-on experiences of working in their own garden. These activities exposed students to the entire growing cycle of several fruits and vegetables during the course of the nutrition education program. All nutrition lessons and garden activities were developed around the SCT, in that objectives were set to influence personal, behavioral, and environmental factors believed to positively alter students' dietary behaviors.

2. **Pilot-Testing of the Curriculum:** Of the schools contacted, three were chosen to participate in the pilot-testing of the curriculum. Crops were planted in January in Northern California and harvested that spring. Most of the crops considered for the project took about four to five months to harvest in this region. As a result, the lessons were taught every other week for a total of 17 weeks. A newsletter was developed and sent home to the students' families to reinforce concepts taught in class and provoke family discussions on the weeks between the lessons. For this project, the primary investigator delivered all nutrition lessons and a master gardener led all gardening activities. This was done to reduce the potential confounding factor of variation between educators.

The initial draft of each nutrition lesson, including handouts, was taught in a 4th-grade classroom at a school site not included in the formal evaluation of the curriculum. The presentation of the lesson was tape-recorded to ensure that teacher and student comments were accurately noted. The goal was to determine content clarity and implementation feasibility. Following the initial presentation, the tape was reviewed to evaluate recorded comments. The lesson plan and handouts were revised accordingly.

The revised lesson was then taught to a new group of students following a similar protocol. Feedback from the teacher and students was again used to revise the lesson. This process continued in different classrooms until the researchers had responded adequately to all comments and no additional revisions were necessary. Lessons were taught between two and six times in different classrooms before a final version was formatted for the curriculum. Nutrition and gardening professionals reviewed final nutrition lessons and gardening activities for accuracy.

Master gardeners previously had pilot-tested all gardening activities included in the final curriculum so they were not revised during the field-testing. However, the order in which the hands-on garden activities were taught did change following their initial delivery with the nutrition lessons.

We included nine nutrition lessons in the final curriculum. It was believed that the selected topics would provide students with the basic tools needed to improve their nutrition knowledge and dietary behaviors. The final nutrition lessons chosen were plant parts, nutrient classes, the Food Guide Pyramid, serving sizes, the food label, physical activity, goal setting, consumerism, and healthy snack making.

3. **Assessment Tools:** The assessment tools were pilot-tested in three different schools. The tools included a multiple-choice nutrition knowledge questionnaire and a hands-on vegetable preference survey.
    - **Nutrition Knowledge Questionnaire:** A questionnaire was developed to evaluate the curriculum's effectiveness at improving students' nutrition knowledge. The questions were based on the learning objectives for each lesson. Several multiple-choice questions were written for each lesson and distributed to students during the respective pilot-testing. The goal was to determine whether the questions were grade-level appropriate and if the lessons met the learning objectives. Student responses to these questions were used to modify the content of the lessons, as well as the wording of questions. The final 30 questions were multiple-choice, with four possible responses. Due to the students' varied reading level and comprehension skills, the final questionnaire was read aloud to the class.

      The knowledge questionnaire was evaluated for validity and reliability. Several nutrition professionals evaluated the content validity of the knowledge questionnaire, and only minor changes were necessary. Reliability of the questionnaire was determined among a group of students who had not been exposed to the lessons and were similar demographically to those included in the

formal evaluation (n=73). Students completed the nutrition knowledge questionnaire at two different times, one week apart. The protocol stayed consistent between the two tests, only the order of the questions changed. The reliability coefficient of the questionnaire was 0.81. Thus, the knowledge questionnaire was a valid and reliable assessment tool for determining change in nutrition knowledge.

- ***Food Preference Survey:*** While no single behavior predicts actual food intake precisely, food preferences appear to be one of the strongest predictors (Birch, 1979; Domel et al., 1996; Harvey-Berino et al., 1997). As a result, food preferences served as the basis for the assessment of dietary behavior in this study. The methodology used to evaluate the students' vegetable preferences was modeled after previous studies (Birch, 1979; Domel et al., 1993a; Morris et al., 2001). Each student was presented with a tray of six vegetables: carrots, broccoli, spinach, snow peas, zucchini, and jicama. The researchers deliberately included several vegetables that were either unfamiliar to or typically disliked by most young children.

  All of the vegetables were served raw and plain to ensure that the students' preferences were reflective of the vegetable itself and not the cooking process or dip served with it. Whole vegetables were presented to each student on a tray along with a bite-size piece in a 2-oz. cup for tasting (**Figure 1**). Each student was provided with a fresh set of tasting samples, a cup of water, and a napkin. The protocol was explained to the class in detail, after which groups of three to four students left the room to complete the survey. However, within these groups, students completed this survey *independently* to avoid the influence of peer pressure.

  All students answered six questions for each vegetable. The first question asked the student to write the vegetable's name. There were no penalties for spelling errors or for guessing. The second question asked whether or not the student would like to taste the vegetable, with responses being either "Yes" or "No." No student was forced to taste-test anything. However, if a student did chose to taste a vegetable, he/she was asked to rate his/her preference of the vegetable on a 5-point scale (5=I really liked it a lot, to 1=I really did not like it). Students choosing not to taste the vegetable were asked to leave the preference question blank for that vegetable. Regardless of whether or not they tasted the vegetable, all students were asked to answer three remaining questions: "Do you eat this food at home?" "Would you ask your family to buy this food?" and "Would you eat this food as a snack?" For each question, students could respond with "Yes," "No," or "I don't know." The students responded to questions in the order in which the vegetables were presented. Investigators were present at all times to provide assistance when needed and to check finished surveys for completeness.

  The preference survey methodology was pilot-tested with the same group of 4th-grade students that pilot-tested the knowledge questionnaire. Fourth-graders were capable of completing this preference survey independently following a detailed

discussion of the procedures. After reviewing student questions and comments, only minor changes were made to the survey prior to using it in the formal evaluation. Nutrition professionals evaluated the content validity of the final survey.

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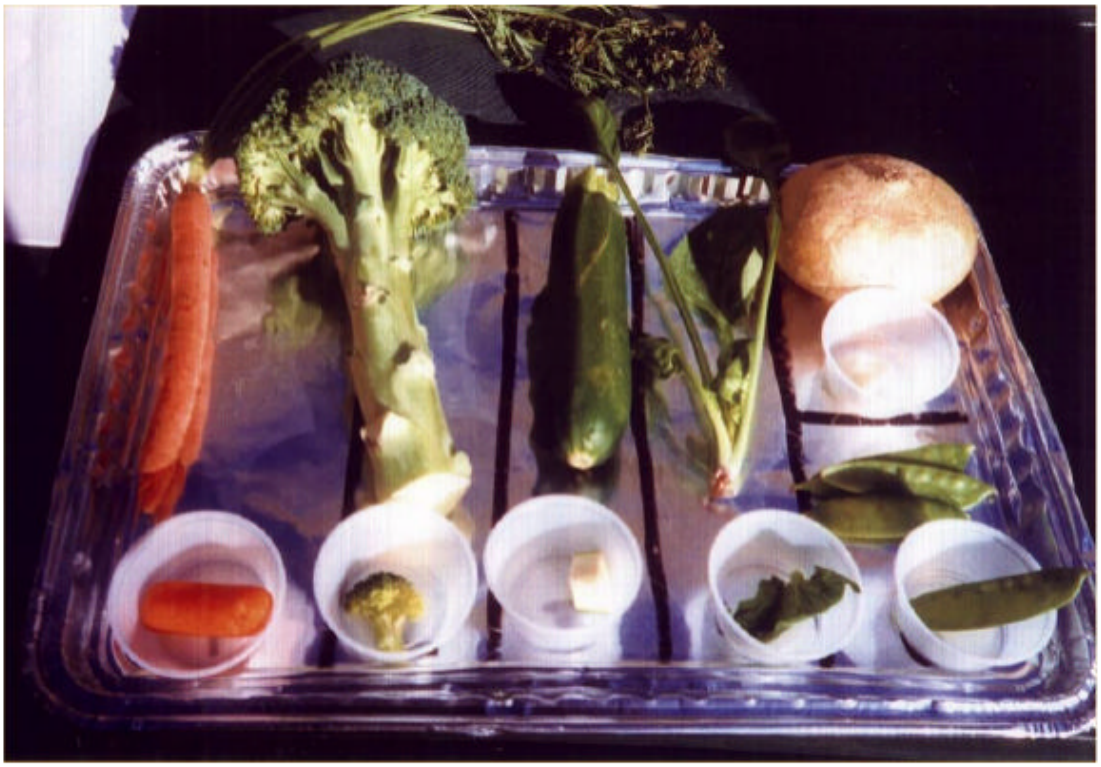
Figure 1. Tray of vegetables given to the students as part of the Vegetable Preference Survey; from left to right, vegetables include a carrot, broccoli, zucchini, spinach, jimaca (top), and snow peas (bottom)



RESULTS AND DISCUSSION

Once all materials were finalized, the researchers began the formal evaluation of the curriculum. The curriculum was formally evaluated in 4th-grade classrooms at three schools: a control site receiving no formal nutrition or gardening lessons (CO), one intervention site receiving only the in-class nutrition lessons (NL), and a second intervention site receiving all the nutrition lessons and gardening activities (NG). All students (n=215) completed a nutrition knowledge

questionnaire and a vegetable preference survey before the intervention (pre-test), after the intervention (post-test), and six months later (follow-up).

Results showed that students at the NL and NG sites improved their nutrition knowledge scores following intervention. Students at the NG site showed improvements in their preferences for over half of the vegetables. Most improvements at the NG site were retained at the 6-month follow-up. Results are described in greater detail in a related publication (Morris & Zidenberg-Cherr, 2002).

Additional results are shown in **Table 1**. To control for differences observed for pretest scores among the school sites, data were analyzed using analysis of covariance with the posttest (or follow-up) score as the dependent variable, the treatment group as the fixed factor, and the pretest score as the covariate. The Bonferroni test was used for follow-up comparisons of the main effects of treatment group. The preference questionnaire was analyzed using ranked data, and each vegetable was analyzed separately. Preference scores were ranked on a scale of 1 to 5. All data were analyzed using a statistical program (SPSS, Version 10.0.5). Any differences between schools with regard to the pretest variables were controlled using the analysis of covariance statistical model. When using this statistical test, post-test and follow-up scores are adjusted for pre-test values. Thus, the "adjusted post-test" and "adjusted follow-up" scores are what actually get analyzed.

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Table 1. Total mean scores for four variables related to students' knowledge of and behavior towards six vegetables*

	Post-Test			Follow-Up		
Variable	**CO**	**NL**	**NG**	**CO**	**NL**	**NG**
Ability to correctly name	2. 6 ± 0.1^{a}	3.0 ± 0.1^{ab}	3.3 ± 0.1^{b}	2.8 ± 0.1^{a}	2.9 ± 0.1^{a}	3.2 ± 0.1^{a}
Consumption at home	2.7 ± 0.2^{a}	3.1 ± 0.1^{ab}	3.3 ± 0.1^{b}	2.8 ± 0.2^{a}	3.1 ± 0.2^{a}	3.2 ± 0.1^{a}
Willingness to ask a family member to buy	1.9 ± 0.2^{a}	2.6 ± 0.2^{ab}	2.9 ± 0.2^{b}	2.4 ± 0.2^{a}	2.5 ± 0.2^{a}	2.6 ± 0.2^{a}
Willingness to eat as a snack	1.6 ± 0.2^{a}	2.2 ± 0.2^{ab}	2.4 ± 0.2^{b}	1.5 ± 0.2^{a}	1.9 ± 0.2^{ab}	2.4 ± 0.2^{b}

**Maximum score for each variable was 6 points; means are adjusted for pre-test values; means with a superscript in common within each time point and question are not significantly different ($p<0.05$)*

Students at the NG site scored significantly higher than students at the CO site on the ability to correctly name the vegetables ($F=9.795$, $p<0.0005$), consumption of the food at home ($F=4.165$, $p<0.05$), willingness to ask a family member to buy the food ($F=7.181$, $p<0.005$), and willingness to eat the food as a snack ($F=5.239$, $p<0.01$). Only the NG students' willingness to eat the food as a snack remained significantly greater than the CO students at the 6-month follow-up ($F=6.152$, $p<0.005$). These results show that the gardening activities had a significant impact on the students' attitudes and behaviors toward the vegetables.

We chose 4th-grade students as the study population for several reasons. First, the goal was to develop a curriculum for educators of all elementary grades. By developing a curriculum for upper-elementary schoolchildren, enough content could be included to provide a challenging environment, while teachers of lower-elementary schoolchildren could take the concepts and modify the activities for their younger students. Second, by the time students enter grade 4, they are more familiar than younger students with standardized testing and are better able to complete simple forms of evaluation independently. Third, disordered eating patterns start early in childhood, and prevention programs are needed as early as 5th grade (Smolak et al., 1998). By incorporating an effective nutrition education program into the school curriculum, educators could teach children about moderation and variety, thereby potentially preventing some disordered eating patterns from surfacing. Finally, it was essential that the use of the curriculum could help educators meet the California academic content standards; 4th-grade standards are most compatible with this curriculum.

CONCLUSIONS AND APPLICATIONS

Environmental-based learning describes educational materials that use the environment to teach core subject areas like math, language arts, science, and history (Lieberman & Hoody, 1998). In the context of this education program, the "Nutrition to Grow On" curriculum is a type of environmental based-learning, as it provides opportunities to improve students' knowledge and skills related to healthy eating while simultaneously enhancing their awareness of the environment. Given the knowledge that test scores across several core academic subjects can be increased with an environmental approach to learning (Lieberman & Hoody, 1998), it is reasonable to suggest that "Nutrition to Grow On" may be a new resource by which educators and school foodservice professionals can improve children's knowledge of not only nutrition, but of other core academic subject areas.

It should be stressed that this curriculum was designed with content standards for the core subject areas taught at the elementary school in mind. Thus, the researchers used the garden as the "environment" to teach the core subjects. This is essential given the limited time that teachers have with their students and the recent emphasis on a standard-based educational framework. Teachers need to have new ways to teach the same subjects, as opposed to entirely new subjects to teach. Curriculum specialists at the California Department of Education reviewed all references to standards in this curriculum.

Another benefit of using a garden-enhanced nutrition education curriculum is the increased availability and accessibility of fresh fruits and vegetables. Many children claim they do not like some vegetables simply because they have never seen or tasted them (Domel et al., 1996). The

first step in solving this is to make the vegetable available to the children. One of the reasons children do not eat the vegetables available for them is because they feel that too much preparation is required prior to eating (Domel et al., 1996). Planting vegetables in a garden that children can walk by, harvest, and eat from improves their accessibility to those vegetables. In addition, if enough is produced, foods can be served as part of the school lunch for the whole school to enjoy. This also has the potential to lower foodservice costs. Some school-garden programs even use their garden produce to help support school fundraising activities or local community service events.

Gardens also provide students with hands-on experience throughout growing, harvesting, and preparing common and uncommon foods. This allows students to gain complete ownership in the process of selecting the foods they eat. Children are more likely to taste vegetables that they grow themselves versus vegetables presented to them (Morris et al., 2001). In addition, gardens provide a wonderful opportunity for foodservice staff, parents, and community members to become involved with the project. Foodservice staff can work with teachers ahead of time as the garden is being planned and crops are being chosen to menu options once crops are harvested.

In conclusion, this garden-enhanced nutrition education curriculum is an effective tool for improving the nutrition knowledge and vegetable preferences of elementary schoolchildren. It was exciting to find that not only were children's nutrition knowledge and preferences improved following the delivery of the "Nutrition to Grow On" curriculum, but children's attitudes toward vegetables at home also were positively enhanced. After participating in the program, children were more likely to consume vegetables at home, more willing to ask a family member to purchase vegetables, and more willing to include vegetables as a snack.

The "Nutrition to Grow On" curriculum currently is being distributed by the California Department of Education and recently received the Award of Excellence from the National School Public Relations Association. Educators nationwide are using "Nutrition to Grow On" to teach nutrition and agriculture to students while simultaneously meeting their state's academic content standards.

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REFERENCES

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Basch, C.E., Zybert, P., & Shea, S. (1994). 5-A-DAY: Dietary behavior and the fruit and vegetable intake of Latino children. *American Journal of Public Health, 84,* 814-818.

Birch, L.L. (1979). Preschoolchildren's food preferences and consumption patterns. *Journal of Nutrition Education, 11,* 189-192.

Birch, L.L. (1980). Effects of peer models' food choices and eating behaviors on preschoolers' food preferences. *Child Development, 51*, 489-496.

Block, G. (1982). A review of validations of dietary assessment method. *American Journal of Epidemiology, 115,* 492-505.

California Department of Education (CDE) (2002). Dataquest. [Online]. Available at: http://www.cde.ca.gov/dataquest.

Contento, I., Balch, G.I., Bronner, Y.L., Paige, D.M., Gross, S.M., & Bisignani, L. (1995). Nutrition education for school-aged children. *Journal of Nutrition Education, 27,* 298-311.

Dennison, B.A., Rockwell, H.L., & Baker, S.L. (1998). Fruit and vegetable intake in young children. *Journal of the American College of Nutrition, 17,* 371-378.

Domel, S.B., Baranowski, T., Davis, H., Leonard, S.B., Riley, P., & Baranowski, J. (1993a). Measuring fruit and vegetable preferences among 4th- and 5th-grade students. *Preventive Medicine, 22,* 866-879.

Domel, S.B., Baranowski, T., Davis, H., Thompson, W.O., Leonard, S.B., & Riley, P. (1993b). Development and evaluation of a school intervention to increase fruit and vegetable consumption among 4th- and 5th-grade students. *Journal of Nutrition Education, 25,* 345-349.

Domel, S.B., Thompson, W.O., Davis, H.C., Baranowski, T., Leonard, S.B., & Baranowski, J. (1996). Psychosocial predictors of fruit and vegetable consumption among elementary schoolchildren. *Health Education Research, 11,* 299-308.

Harvey-Berino, J., Hood, V., Rourke, J., Terrance, T., Dorwaldt, A., & Secker-Walker, R. (1997). Food preferences predict eating behavior of very young Mohawk children. *Journal of the American Dietetic Association, 97,* 750-753.

Joshipura, K.J., Ascherio, A., Manson, J.E., Stampfer, M.J., Rimm, E.B., & Speizer, F.E. (1999). Fruit and vegetable intake in relation to risk of ischemic stroke. *Journal of the American Medical Association, 282,* 1,233-1,239.

Kelder, S.H., Perry, C.L., Klepp, K., & Lytle, L.L. (1994). Longitudinal tracking of adolescent smoking, physical activity, and food choice behaviors. *American Journal of Public Health, 84,* 1121-1126.

Kennedy, E., & Goldberg, J. (1995). What are American children eating? Implications for public policy. *Nutrition Reviews, 53,* 111-126.

Krebs-Smith, S.M., Cook, A., Subar, A.F., Cleveland, L., Friday, J., & Kahle, L.L. (1996). Fruit and vegetable intakes of children and adolescents in the United States. *Archives of Pediatrics and Adolescent Medicine, 150,* 81-86.

Krebs-Smith, S.M., Heimendinger, J., Patterson, B.H., Subar, A.F., Kessler, R., & Pivonka, E. (1995). Psychosocial factors associated with fruit and vegetable consumption. *American Journal of Health Promotion, 10*, 98-104.

Lieberman, G.A., & Hoody, L.L. (1998). Closing the achievement gap: Using the environment as an integrating context for learning. San Diego, CA: State Education Board and Environmental Roundtable.

Luepker, R.V., Perry, C.L., McKinlay, S.M., Nader, P.R., Parcel, G.S., & Stone, E.J. (1996). Outcomes of a field trial to improve children's dietary patterns and physical activity: The Child and Adolescent Trial for Cardiovascular Health (CATCH). *Journal of the American Medical Association, 275,* 768-776.

Lytle, L., & Achterberg, C. (1995). Changing the diet of America's children: What works and why? *Journal of Nutrition Education, 27,* 250-260.

Morris, J.L., Briggs, M., & Zidenberg-Cherr, S. (2000). School-based gardens can teach kids healthier eating habits. *California Agriculture, 54,* 40-46.

Morris, J.L., Neustadter, A., & Zidenberg-Cherr, S. (2001). First-grade gardeners are more likely to taste vegetables. *California Agriculture, 55,* 43-46.

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

Munoz, K.A., Krebs-Smith, S.M., Ballard-Barbash, R., & Cleveland, L.E. (1997). Food intakes of U.S. children and adolescents compared with recommendations. *Pediatrics, 100,* 323-329.

National Research Council (NRC). (1989). Diet and Health: Implications for reducing chronic disease risk. Washington, DC: National Academy Press.

Perry, C.L., Bishop, D.B., Taylor, G., Murray, D.M., Mays, R.W., & Dudovitz, B.S. (1998). Changing fruit and vegetable consumption among children: The 5-A-Day Power Plus Program in St. Paul, Minnesota. American Journal of Public Health, 88, 603-609.

Perry, C.L., Mullis, R.M., & Maile, M.C. (1985). Modifying the eating behavior of young children. *Journal of School Health, 55,* 399-402.

Resnicow, K., Cohn, L., Reinhardt, J., Cross, D., Futterman, R., & Kirschner, E. (1992). A three-year evaluation of the know-your-body program in inner-city schoolchildren. *Health Education Quarterly, 19,* 463-480.

Reynolds, K.D., Baranowski, T., Bishop, D.B., Farris, R.P., Binkley, D., & Nicklas, T.A. (1999). Patterns in child and adolescent consumption of fruit and vegetables: Effects of gender and ethnicity across four sites. *Journal of the American College of Nutrition, 18,* 248-254.

Smolak, L., Levine, M.P., & Schermer, F. (1998). A controlled evaluation of an elementary school primary prevention program for eating problems. *Journal of Psychosomatic Research, 44,* 339-353.

Steinmetz, K.A., & Potter, J.D. (1991). Vegetables, fruit, and cancer. *Cancer Causes and Control, 2,* 427-442.

U.S. Department of Agriculture and U.S. Department of Health and Human Services. (1992). The Food Guide Pyramid. (Home and Garden Bulletin No. 252). Washington, DC: U.S. Government Printing Office.

U.S. Department of Agriculture and U.S. Department of Health and Human Services (2000). Dietary Guidelines for Americans (5th ed.). Washington, DC: U.S. Government Printing Office.

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