

Research and Professional Briefs

California Teachers Perceive School Gardens as an Effective Nutritional Tool to Promote Healthful Eating Habits

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ABSTRACT

This study assessed elementary school teachers' perceived attitudes and barriers associated with school gardens, as well as the purpose and use of gardens in schools, specifically in relation to the link between gardens and nutrition. The questionnaire was mailed to California fourth-grade teachers at schools with gardens (N=1,665). The response rate was 36% (n=592). Teachers perceived the garden to be somewhat to very effective at enhancing academic performance, physical activity, language arts, and healthful eating habits. Nutrition was taught with the use of the garden by 47% of responding teachers. This research provides evidence for needed standards-based curricula materials and teacher training in relation to gardening and nutrition. The results from this study will contribute to development of needed resources and methods by which to encourage the use of gardens and nutrition education in schools.

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California's past initiative to have "A Garden in Every School" encouraged schools to establish and sustain school and community gardens as a learning laboratory or outdoor classroom (1). This initiative was consistent with the Centers for Disease Control and Prevention's recommendations to create a school environment that supports regular physical activity and healthy eating habits (2,3).

In recent years, there has been a movement toward implementation of comprehensive school health programs, including nutrition and food policies that address issues such as classroom nutrition education, competitive

food standards, and food and nutrition services (4). This is likely the result, at least in part, of the childhood and adolescent obesity epidemic (4-6). Obesity-prevention program guidelines suggest that policies be implemented to promote a positive eating environment (7).

Nutrition education should be provided in schools, especially during elementary and middle school years, as eating patterns appear to shift as students progress into middle school and junior high (8). Teachers in schools are powerful contributors to children's learning; however, they face time constraints in the current educational system, which is focused on academic achievement and meeting academic standards. Teachers may be more likely to teach nutrition in their classrooms if they are shown how to effectively incorporate nutrition topics into existing science, language arts, math, and social science curricula.

The research presented here focused on gardens in California schools based on evidence that garden-enhanced nutrition education can positively affect children's nutrition knowledge as well as their preferences for vegetables (9). This, in turn, may affect their intake of vegetables, as studies suggest that preference for a food is related to increased intake of that food (10-12). The purpose of this study was to assess teachers' use of gardens in academic instruction as well as their attitudes and perceived barriers associated with the integration of school gardens within the school system. It was a follow-up to a survey of principals regarding the status of gardens in schools (13,14).

METHODS

Survey Development and Distribution

A self-administered mailed questionnaire was sent to California fourth-grade teachers at schools with gardens (N=1,665). Fourth-grade teachers were surveyed based on the existing curriculum and content of the state standards. A garden was defined as "plants grown in the ground, in raised beds, in pots, or in greenhouses in both classrooms or outdoors." The project employed Dillman's Tailored Design Methodology (15) to survey a subset of California school teachers from schools where principals had previously responded to the same questionnaire (13,14). The questionnaire was distributed through the postal service, with multiple contacts made to potential respondents. The study was reviewed and approved by the committee on the Use of Human Subjects, University of California, Davis.

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Table 1. California fourth-grade teachers' perceived effectiveness of the school garden at enhancing skills, subjects taught in school, habits, and the school meal program (n=592)

	Not effective (%)	Slightly effective (%)	Somewhat effective (%)	Moderately effective (%)	Very effective (%)	No opinion (%)
Physical education	31	13	11	6	2	37
Academic performance	8	14	19	16	12	32
School meal program	38	8	6	4	4	40
Healthful eating habits	14	13	18	13	12	30
Social skills	7	7	18	23	18	29
Mathematics	13	12	18	15	10	33
Language arts	12	11	15	19	12	32
Science	5	4	13	19	34	26
Physical activity	9	12	16	13	18	31

Content of Questionnaire

The questionnaire was composed of 14 items that were either categorical yes-or-no items or scales containing multiple items to measure variables in three areas pertaining to gardens in schools: current practices, attitudes, and barriers. An additional item was provided at the end of the questionnaire for any comments provided by the teachers. Additional descriptions of the questionnaire design can be found elsewhere (13,14).

Statistical Analysis

Survey data were analyzed to generate frequency distributions for each question and χ^2 analyses were performed to determine statistical significance ($P < .05$) for selected questions.

RESULTS

Sample Characteristics

Questionnaires (N=1,665) were sent to fourth-grade teachers at schools previously reported to have gardens (13,14). A total of 592 questionnaires were completed and returned, resulting in a 36% response rate. One questionnaire was used from each school for data analysis. If more than one questionnaire was returned by teachers from one school, one was randomly selected for use in analysis.

Schools were categorized as either low-income, defined as $\geq 50\%$ eligibility for free or reduced-priced lunches, or non-low-income, defined as $< 50\%$ eligibility for free or reduced-priced lunches. Of the teachers responding, 45% were from low-income schools and 55% were from non-low-income schools. There were no significant differences between low-income and non-low-income schools with respect to the status or use of gardens.

Current School Garden Practices

Flowering plants, vegetables, and herbs were the most commonly grown plants in school gardens, with 71%, 67%, and 50% of teachers responding positively, respectively. The most frequent reason for having a garden was for enhancement of academic instruction (72%). School gardens were reported as being used to provide edible produce by 38% of responding teachers.

The garden was used for academic instruction by 68% of responding teachers. The most frequently taught subject areas using the garden included science (65%), nutrition (47%), environmental studies (43%), language arts (42%), math (40%), and agricultural studies (27%). Numerous comments were received that provided examples of the use of gardens in academic instruction. One teacher stated, "It's a great way to tie in nutrition, math, science, and language arts skills." Another noted, "The garden has provided a valuable context for student learning." Specifically, teachers noted using the garden to enhance writing skills through journal writing in the garden and math skills with garden-related problem-solving.

Teachers' Attitudes Surrounding School Gardens

When asked about the effectiveness of the school garden at enhancing skills, subject matter taught in school, habits, and the school meal program, most teachers believed the garden to be moderately to very effective, on a five-point scale, at enhancing science (53%) and social skills (eg, teamwork, sharing, and communication skills) (41%). Teachers perceived the garden to be somewhat to very effective at enhancing academic performance (47%), physical activity (47%), language arts (46%), and healthful eating habits (43%). Teachers offered multiple examples demonstrating the perceived effectiveness of the school garden at enhancing healthful eating habits. One teacher remarked on the "salad parties" from the garden: "Surprisingly, even cooked Swiss chard had students begging for second and third helpings." Another teacher commented, "Our garden has provided children the experience of fresh veggies versus fast food, which has made a huge difference in diet, nutrition education, and pride in growing food." For the same question, 46% of teachers deemed the garden as being not effective or slightly effective at enhancing the school meal program (Table 1).

Teachers strongly agreed that resources such as teacher training for gardening and its connection to curriculum (51%), curriculum materials linked to academic instruction (50%), and lessons on teaching nutrition in the garden (46%) would assist in the school garden being used for academic instruction (Table 2). Typical of comments received from teachers is a fourth-grade teacher who remarked, "I wish the state would offer more re-

Table 2. Resources that would assist in the school garden being used by teachers for academic instruction according to California fourth-grade teachers (n=592)

Resources	Strongly disagree (%)	Somewhat disagree (%)	Somewhat agree (%)	Strongly agree (%)	No opinion (%)
Curriculum materials linked to academic standards	2	2	19	50	5
Teacher training for gardening	2	5	23	43	6
Teacher training for gardening and its connection to curriculum	1	3	18	51	5
Information on composting and/or vermiculture	4	7	27	32	9
Lessons on teaching nutrition in the garden	3	3	21	46	6

sources for teacher training to further integrate our garden and the opportunity for hands-on learning in all subject areas.”

Barriers to Using the School Garden in Academic Instruction

Teachers noted that the greatest barrier to using the garden for academic instruction was time (67%). Other dominating barriers included lack of teachers’ interest in gardening (63%), lack of teachers’ experience with gardening (61%), lack of curricular materials linked to academic standards (60%), lack of teachers’ knowledge of gardening (60%), and lack of teacher training in relation to gardening (58%).

DISCUSSION

Academic Instruction and School Gardens

Our results suggest that fourth-grade teachers predominately use school gardens to enhance academic instruction, consistent with principal responses obtained previously (13,14). It is encouraging that some teachers are using the garden in teaching nutrition (47%) as well as in teaching core subject areas such as science (65%), language arts (42%), and math (46%). Previous evidence has shown the usefulness of school gardens in providing an engaging environment effectively used as an instructional tool in several subject areas, including nutrition (16,17).

However, although school gardens are perceived as being effective at enhancing academic instruction, teachers strongly agreed that there is a need for multiple resources, such as curriculum linked to instruction, teacher training for gardening and its connection to curriculum, and lessons on teaching nutrition in the garden.

The pressure to teach in a standards-based educational system was a noted barrier to using school gardens. However, nutrition education can be provided through integration with core subject areas already taught in the classroom, in the garden, and in the cafeteria.

Perhaps additional marketing of information to schools will assist in exposing educators to materials and training available that will meet specific school needs (1,18-20). Training was noted by teachers as a needed resource and is crucial if teachers are to effectively teach students about concepts surrounding gardens and nutrition. This is consistent with data that suggest a lack of teacher training on the topic of nutrition (21). Students taught by trained teachers have been shown to have higher nutrition knowledge and attitude scores compared with being taught by untrained teachers (22).

Link Between the School Meal Program and the Garden

Data from the current and previous studies suggest that teachers and principals recognize that the garden can enhance healthful eating habits, but the link between the school meal program, the garden, and healthful eating habits is lacking. Schools with gardens have the opportunity to enhance the school meal program by exposing students to fresh produce when it becomes available, possibly leading to changes in dietary habits through students gaining knowledge of the origins of food (23). Previous research that we have conducted indicates a lack of involvement of foodservice staff with school gardens (24). Perhaps efforts should focus on building partnerships among teachers, who are often responsible for school gardens, and foodservice staff.

This research provides evidence for needed standards-based curricula materials and teacher training in relation to gardening and nutrition. It would be of benefit for state and federal agencies to provide stronger communication links through partnering with schools to promote children’s health. Establishing school nutrition policies is a necessary component in administering comprehensive school nutrition programs (4). Dietetics professionals employed by the school system are encouraged to increase their involvement in nutrition policy development, which would include communication with administrators and teachers on planning trainings on teaching nutrition in the classroom, as well as curricula development to integrate nutrition topics into existing standards-based curricula. Gardens can be an integral part of a district-wide food-related policy that encourages a healthy nutritional environment (24).

Dietetics and nutrition education practitioners are well-suited to provide schools with support in encouraging the provision of nutrition education in school classrooms. In the current study, 67% of teachers somewhat to strongly agreed that lessons on teaching nutrition in the garden would assist in the garden being used for academic instruction; therefore, dietetics professionals could be of assistance in training teachers on how to teach nutrition in the garden or in the classroom.

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