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## Use of School Gardens in Academic Instruction

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### ABSTRACT

**Objective:** To determine the status of gardens in California schools.

**Design:** A self-administered Internet and mailed survey was sent to all California principals (N = 9805).

**Participants:** 4194 California school principals.

**Variables Measured:** School garden practices, attitudes associated with the use of gardens in schools, and perceptions of barriers to having and using school gardens in academic instruction.

**Analysis:** Descriptive statistics and chi-square;  $P < .05$ .

**Results:** A 43% response rate was achieved. The most frequent reason for having a garden was for enhancement of academic instruction. Gardens were most commonly used for teaching science, environmental studies, and nutrition. Principals strongly agreed that resources such as curriculum materials linked to academic instruction and lessons on teaching nutrition in the garden would assist in the school garden being used for academic instruction. Principals deemed the garden as being not to slightly effective at enhancing the school meal program.

**Conclusions and Implications:** School gardens appear to be predominantly used by most schools to enhance academic instruction. There is a need for curriculum materials and teacher training for gardening and nutrition. The link between the garden and the school meal program is an area that clearly requires attention. School lunch would be a logical setting for provision of edible produce, in addition to taste-testing of fresh produce in the garden or classroom setting.

**KEY WORDS:** schools, gardens, students

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### INTRODUCTION

School gardens can positively impact children's food choices by improving their preferences for vegetables and increasing their nutrition knowledge.<sup>1-5</sup> Studies conducted using school gardens and structured garden-enhanced nutrition education curriculum applying Social Cognitive Theory have reported increases in students' fruit and vegetable consumption.<sup>1-4,6,7</sup>

School foodservice programs and gardens in schools offer an excellent avenue through which to educate students about healthful eating habits. In addition, gardening can be a beneficial component of the educational environment that provides teachers with an excellent opportunity to teach nutrition, as well as other subject areas and important life skills. It has been demonstrated that environmentally-based educational programs can have a beneficial impact on performance on standardized achievement tests, as well as attention and enthusiasm for learning.<sup>8</sup> Based on these and other benefits, a goal has been established to have a garden in every school in California. The initiative "A Garden in Every School" encouraged schools to establish and sustain school and community gardens as a learning laboratory or outdoor classroom.

As a result of this initiative, it was important to assess a number of factors related to the use of gardens in California public schools. The last documented evidence of existing gardens in schools resides in a 1998 analysis, which reported that at least 13% of California public schools had gardens in 1996.<sup>9</sup> Therefore, the study presented in this article sought to determine the current status of gardens in public schools in California. Specifically, constructs from the PRECEDE-PROCEED model were used to assess 3 areas: (1) current school garden practices, (2) attitudes associated with the use of gardens in schools, and (3) barriers to having and using a school garden in academic instruction.<sup>10</sup>

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## STUDY PROCEDURES

### Survey Development

The project employed Dillman's mail and Internet survey methodology using a mixed-mode strategy to survey the entire population of California school principals (N = 9805).<sup>11</sup>

### Content of Questionnaire

The questionnaire was composed of 18 items that were either categorical yes/no items or scales containing multiple items to measure variables in 3 areas pertaining to gardens in schools: current practices, attitudes, and barriers. A garden was defined as "plants grown in the ground, in raised beds, in pots or in greenhouses in both classrooms or outdoors." Current practices in the schools were assessed by asking questions, including whether principals had a garden at their school and, if so, if they used the garden for academic instruction, if subjects were taught with the use of the school garden, the purpose of the garden, items grown in the garden, the type of garden, and the person(s) responsible for the garden. Principals' attitudes surrounding school gardens were assessed using questions including perceived effectiveness of the garden, resources needed to sustain the school garden, and resources that would assist in the garden being used for academic instruction. Questions to identify barriers to using the garden in academic instruction and to having a school garden were also included.

### Validity and Reliability of Questionnaire

This questionnaire was developed specifically for this project by a team of nutrition professionals and a horticulture professional. These individuals evaluated the survey for content validity, and revisions were made as necessary. The questionnaire was developed and then pilot-tested with a randomly selected group of principals (n = 30) to assess the clarity and feasibility of completing the questionnaire on-line, with revisions made as needed.

Survey data were analyzed using SPSS, version 10.0 for Macintosh (SPSS Inc., Chicago, Ill), to generate frequency distributions for each question and chi-squared analyses to determine statistical significance ( $P \leq .05$ ) for selected questions.

### Survey Distribution

The questionnaire was distributed using 2 methods: electronic mail (e-mail) with a Web site linkage containing the questionnaire and the postal service. The questionnaire was developed and implemented with a goal of obtaining at least a 30% response rate.<sup>11</sup> It was administered and distributed in the following manner:

1. An announcement letter from the superintendent of public instruction was sent via postal mail to all principals in California (N = 9805) announcing the survey and asking

for their participation. As an incentive to complete the survey, seed packets were provided to the school principals.

2. The questionnaire was sent to principals via e-mail for principals with accessible e-mail addresses or via postal mail to those without accessible e-mail addresses (n = 763). It was sent 1 week after the initial letter imbedded in an e-mail message to the population of principals with a letter asking for their participation in the survey and a link to the Web site from which the questionnaire could be accessed. Once the survey was complete, principals clicked on a submit button, which downloaded the data into an Access database. A message then appeared thanking them for their participation and confirming receipt.
3. One week following the first e-mail message, a reminder/thank you e-mail was sent to those who had completed the questionnaire and to remind nonresponders to complete it.
4. A final letter was mailed 2 weeks later to thank those who had completed the questionnaire. For those who had not completed it, a paper version was mailed asking for completion and return by mail using the self-addressed, stamped envelope provided. All returned data from the paper questionnaires were entered into the same database used for the on-line version.

All procedures were reviewed and approved by the Committee on the Use of Human Subjects, University of California, Davis.

## LESSONS LEARNED

### Sample Characteristics

A total of 4194 questionnaires were completed and returned via the Internet or postal mail, resulting in a 43% response rate. There were 2286 (54.5%) submitted through the Internet and 1908 (45.5%) submitted through postal mail. The greatest percentage (91%) of completed questionnaires were submitted via the Internet within the first week after e-mails were sent out. Over half (61%) of the mailed questionnaires were returned within 2 weeks of being mailed.

Demographic data collected from the survey showed that of the respondents, 73% and 27% of schools were located in urban and rural areas of California, respectively. School respondents included 2340 (56%) elementary, 367 (9%) kindergarten through eighth grade, 542 (13%) middle/junior high, 475 (11%) high schools/senior high, 234 (6%) continuation high schools, and 219 (5%) schools described as other.

### Description of School Gardens

Of the respondents, 57% (N = 2381) answered yes to having a school garden. Gardens were predominantly located in elementary (64%) and K-8 schools (60%). There were significantly more urban schools with gardens (58%) compared with rural schools with gardens (54%). Most of the gardens

were in the ground (69%) or in a raised bed (60%), with less than half (46%) of principals describing the school garden as being potted plants or off school campus.

### Purpose of School Gardens

The most frequent reason for having a garden was for enhancement of academic instruction (89%). Extracurricular activities were also reported as a reason for having a school garden, with 60% of principals responding yes to that question. It is also notable that 39% of school gardens were reported as being used to provide edible produce.

### What Is Grown in School Gardens?

Flowering plants and vegetables were the most commonly grown plants in school gardens, at 90% and 77%, respectively. Herbs were grown in 53% of gardens.

### Gardens and Academic Instruction

The garden was used for academic instruction by 85% of responding schools. Of this group, the most frequently taught subject areas using the garden included science (95%), environmental studies (70%), and nutrition (66%) (Table 1).

The use of the garden to assist in teaching subjects was categorized by school type. Elementary and kindergarten through eighth grade schools ( $n = 1706$ ) most frequently reported using the garden to teach science (86%), environmental studies (64%), and nutrition (63%). Middle schools ( $n = 246$ ) predominantly used the garden to teach science (71%). High schools ( $n = 226$ ) reported using the garden most frequently in teaching agricultural studies (66%) and science (56%).

### Responsibility for School Gardens

Responsibility for the school garden most frequently resided with teachers (86%), followed by parent volunteers (44%) and students (36%).

### Assessment of Principals' Attitudes

When asked about the effectiveness of the school garden at enhancing skills, subject matter taught in school, habits, and the school meal program, most principals believed the garden to be moderately to very effective, on a 5-point scale, at enhancing science (69%) (Table 2). Most principals (55%) deemed the garden as being not effective or slightly effective at enhancing the school meal program (see Table 2).

Principals strongly agreed that resources such as curriculum materials linked to academic instruction (60%) and lessons on teaching nutrition in the garden (50%) would assist in the school garden being used for academic instruction.

The most prominent resources that principals strongly agreed would assist in sustaining the garden included fund-

Table 1. Subjects Taught Using the Gardens among Schools Surveyed (%)\*

Subjects Taught	All Schools ( $n = 4194$ )	Elementary/ K-8 ( $n = 1706$ )	Continuation High Schools ( $n = 97$ )
Science	95 (1913)	86 (1462)	74 (72)
Environmental studies	70 (1423)	64 (1093)	54 (52)
Nutrition	66 (1342)	63 (1079)	40 (39)
Language arts	60 (1213)	62 (1064)	24 (23)
Math	59 (1183)	58 (992)	30 (29)
Agricultural studies	46 (925)	35 (598)	42 (41)

\*Values are percentages of the total yes responses, with the number of schools in parentheses.

ing (74%), staff support (67%), administrative support (63%), time (58%), parent volunteers (57%), and a garden coordinator (54%).

### Barriers

Perceived barriers were identified by asking 2 questions: the limitations of using the garden for academic instruction and the barriers to having a school garden. The greatest barriers for using the garden for academic instruction were time (88%), a lack of curricular materials linked to academic standards (74%), and a lack of teachers' interest, knowledge, experience, and training in relation to gardening (70%).

For the schools without gardens, the 3 largest barriers to having a school garden were a lack of funding (60%), time constraints (57%), and a lack of gardening supplies (49%).

### DISCUSSION

Based on data obtained from the survey, it is impressive to note that the number of gardens in schools has increased from an estimated 13% ( $n = 890$ ) of California schools in 1996 to at least 24% ( $n = 2381$ ).<sup>9</sup>

In the current study, gardens were most commonly found in elementary schools and K-8 schools. This finding is not surprising because most students are in the same classroom throughout the school day and state core curriculum standards at these grade levels may be perceived as easier to meet with the use of the garden compared with standards in middle and high schools.<sup>12</sup>

School gardens appear to be predominantly used by most schools to enhance academic instruction through teaching subjects such as science, environmental studies, nutrition, language arts, and math. This indicates that the garden is being used to teach some of the core academic subjects, possibly with the incorporation of core curriculum standards.<sup>12</sup> This is consistent with research in which gardens are being used to incorporate core curriculum in a hands-on setting.<sup>13</sup> Engaging, hands-on learning activities incorporated into

subject matter are key components of experiential education in which environment-based education programs have been employed, emphasizing the development of lifelong learning skills, such as problem solving and critical thinking. These programs use a multidisciplinary approach to educating students and have been shown to increase test performance, attention, and enthusiasm for learning and to decrease discipline issues in the classroom.<sup>8</sup>

Subjects taught with the use of the garden are similar among grade levels, with a few notable differences. Science was consistently reported as being taught using the garden throughout elementary grade schools to continuation high schools. The frequency of subjects being incorporated into the garden setting appeared to drop off with the middle schools, high schools, and continuation high schools, where the garden was used to teach only 1 or 2 subjects, compared with elementary and K-8 schools, which reported using the garden to teach 4 to 5 subjects with high frequency. Agricultural studies were predominant in high schools, where it is likely that a course is offered in this subject area and that the garden is used primarily for the course.

The limitations of this study include the lack of pretesting for reliability of the survey items and scales and the 43% response rate from the 9805 possible respondents. Although a higher response rate would have improved our ability to generalize the results for this population, Dillman suggests a minimum response rate of 30%, which was achieved in this study.<sup>11</sup>

## IMPLICATIONS FOR RESEARCH AND PRACTICE

It is encouraging that some schools are using the garden for the production of edible produce but also unfortunate that most principals perceived the garden as being not to slightly effective at enhancing the school meal program. The link between the garden and the school meal program is an area that clearly requires attention because the school meal program possesses the ability to provide students with an opportunity to integrate experiences from the garden into their lunch meal choices.<sup>3</sup> This could affect dietary habits, including preferences and intake for fruits and vegetables based on evidence suggesting that increased exposure to foods can increase preferences for those foods.<sup>2,14</sup> Improving communication among foodservice staff, teachers, administrators, and others involved in the school garden may assist in identifying ways in which the garden can effectively enhance the school meal program. This may be initiated through the development of a school nutrition policy that is a coordinated effort among foodservice staff, teachers, and others involved in the school garden.<sup>15,16</sup>

It is not surprising that time is considered a major barrier when the greatest percentage of responses shows that teachers are responsible for the garden. This can be a tremendous burden on an individual who already has sig-

nificant responsibilities associated with duties as a teacher. There is a need for strategies so that volunteers and community members are used more effectively to relieve teachers from time spent focusing on garden responsibilities. This is consistent with principals' responses to the question of resources that would assist in sustaining the garden, in which 54% to 57% strongly agreed that having a parent volunteer and/or having a garden coordinator were resources that would assist in sustaining the garden. Other resource options include accessing AmeriCore volunteers, as well as master gardeners and Cooperative Extension staff. Another barrier to having a garden in schools was a lack of funding.

The results from this study indicate a need for curriculum materials and teacher training for gardening and nutrition. Increased awareness of the resources schools need to promote the incorporation of gardens in curricula allows for the development of appropriate, relevant materials. One such resource, which was recently developed by the California Department of Education, the University of California, Davis Children's Garden Program, and the Occidental Arts and Ecology Center, is a framework, *The Guide for Linking School Gardens to California Educational Standards*, which describes available instructional materials that link gardens and nutrition to educational standards.<sup>12</sup> Perhaps additional marketing of information to schools will assist in exposing educators to the materials and training available to meet the specific needs of schools in California. Training was noted as a needed resource as well and is crucial if teachers are to teach students effectively about concepts surrounding gardens and nutrition. Students taught by trained teachers have been shown to have higher nutrition knowledge and attitude scores compared with students taught by untrained teachers.<sup>17</sup>

In conclusion, the results obtained from the *Statewide Principals' School Garden Survey* identified principals' attitudes pertaining to the use of gardens in schools, needed resources surrounding gardens, and barriers associated with gardens in the school environment. This wealth of information can be used to better meet school needs and to promote gardens in schools. It is anticipated that this will move us closer to meeting the goal of improving nutrition and health knowledge, as well as the eating habits of children.

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