

The development and implementation of an inquiry-based nutrition education curriculum for the Shaping Healthy Choices Program

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ABSTRACT

The objective of this study was to develop and evaluate an inquiry-based nutrition education curriculum that includes garden-based extension activities. The curriculum is intended to help students learn key nutrition concepts and improve science process skills that are important for making healthy choices. Curriculum topics include: roles of nutrients, MyPlate recommendations, physical activity, reading food labels, understanding consumerism, and making healthy snacks. This curriculum was implemented among 4th-grade children as part of the Shaping Healthy Choices Program (SHCP), a multi-component, controlled intervention. Schools meeting inclusion criteria were randomly assigned to control (C) or intervention (I) groups. Participation was n=133 (C) and n=177 (I). Percent eligibility in the Free and Reduced-Price Meal Program was 30-35%. Basic Test of Science Processing Skills (BAPS) mean scores were 25.9 (C) and 25.6 (I) out of 35, and nutrition knowledge mean scores were 20.2 (C) and 19.5 (I) out of 35. BAPS was correlated with nutrition knowledge ($r=0.51$; $P<0.001$). Qualitative data included student use of science process skills in nutrition-related problems and journal reflections from classroom teachers. Teachers reported enthusiasm by students for lesson content and student learning exceeded their expectations.

INTRODUCTION

The Shaping Healthy Choices Program (SHCP) is a multi-component, randomized, controlled intervention that seeks to improve healthy food-related behaviors. This program integrates five components to achieve sustainable student outcomes. These components are: Nutrition Education & Promotion; Family & Community Partnerships; Foods Available on the School Campus; Supporting Regional Agriculture; and School Wellness Policies.



SHCP Objectives

1. Increase nutrition knowledge and use of science process skills
2. Promote availability, consumption, and enjoyment of fruits and vegetables
3. Improve dietary patterns and encourage physical activity
4. Foster positive changes in the school environment
5. Facilitate development of an infrastructure to sustain the program

A key element of the Nutrition Education & Promotion component was to develop, implement, and evaluate an inquiry-based nutrition science curriculum.



CURRICULUM DEVELOPMENT

The objective of the curriculum, *Discovering Healthy Choices*, is to facilitate student learning of key nutrition concepts and improve science process skills that are important for making healthy food and lifestyle choices. The curriculum consists of eight modules (Table 1), including 15 classroom and garden-based activities in addition to take-home activities. These activities are inquiry-based and learner-centered to allow students to build knowledge and understanding through experience.

Development

- The curriculum development team consisted of SHCP researchers and UC Davis undergraduate student interns.
- The Backward Design Model was used for curriculum development (Wiggins & McTighe, 1998). This approach begins with the identification of learning objectives, followed by designing activities based on these objectives.

Framework

- Learning objectives and concepts were identified from *Nutrition to Grow On*, an existing, award-winning, and nationally recognized garden-enhanced nutrition curriculum (Morris & Zidenberg-Cherr, 2004).
- The inquiry-based activities are structured according to the five-step learning cycle (Pfeiffer & Jones, 1983). This education model allows students to experience nutrition-related problems, reflect on what they observed and their problem-solving strategy, and apply new knowledge and skills in authentic settings.
- Dietary recommendations are aligned with the Dietary Guidelines for Americans 2010.
- Activities support the Common Core State Standards for English Language-Arts and Mathematics, California State Content Standards for Science and Health, and California Nutrition Competencies.
- Activities address constructs of the Social Cognitive Theory.

Activities

- Module topics include: foods, culture, and agriculture; the cardiovascular system and the importance of physical activity; physiological roles of nutrients in supporting health; serving sizes and food labels; MyPlate recommendations; consumerism; and making healthy snacks.
- Additional take-home activities are included to allow further application of concepts and skills learned in the classroom.
- Each module contains a take-home, goal-setting activity.
- Students work together in small groups to foster team work.
- Opportunities for metacognition are built into each activity, allowing students to reflect on and improve their problem-solving strategies.

Pilot-Testing

All classroom activities were pilot-tested with upper-elementary school children in after-school programs in Davis, California. Pilot-testing provided the curriculum development team with formative information regarding student acquisition of learning objectives, student engagement, learner-centeredness, appropriateness of lesson materials, and the time needed for full implementation of each activity. Activities were revised according to observations.

SHCP STUDY DESIGN

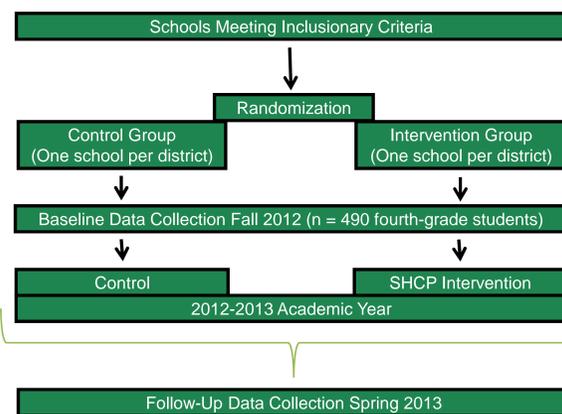
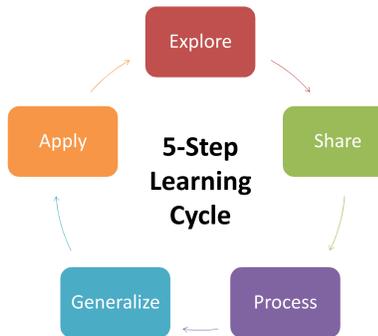


Table 1. *Discovering Healthy Choices* Table of Contents

1. Introduction to Nutrition, Gardening & Agriculture
2. Getting Physically Active
3. Nutrients We Need
4. Serving Sizes
5. MyPlate
6. Food Labels
7. Consumerism
8. Making Healthy Snacks



IMPLEMENTATION

Intervention classrooms (n=10 fourth-grade classrooms)

- Fifteen classroom and garden-based activities, plus take-home activities
- In-class cooking demonstrations that reinforce curriculum content
- Eight parent newsletters with content connected to curriculum

Control classrooms (n=9 fourth-grade classrooms)

- Fifteen hours assisting teachers with classroom activities not related to nutrition, science, or health

SHCP Educator

- A University of California Cooperative Extension representative served as the SHCP educator at both intervention sites
- Received 20 hours of professional development using the Incremental Training Model. This included four sequenced workshops alternated with curriculum delivery at an after-school program in Davis, California.

METHODS

Quantitative Methods

- Nutrition knowledge measured at baseline and follow-up using a 35-item questionnaire that includes eight California STAR released practice questions
- Science process skills measured at baseline and follow-up using the Test of Basic Science Process Skills (BAPS), a 35-item questionnaire; science process skills measured are observation, measurement, communication, classification, prediction, and inference
- Data were analyzed using SAS statistical software

Qualitative Methods

- Teachers record observations and opinions about the curriculum in a journal throughout the intervention.
- SHCP Educator records classroom observations in a journal throughout the intervention.

PRELIMINARY QUANTITATIVE RESULTS

Table 2. Baseline Nutrition Knowledge Scores (n=480)

	n	Mean	SD
Northern California Control	130	20.1	4.0
Northern California Intervention	176	19.5	3.3
California Central Valley Control	100	20.6	3.2
California Central Valley Intervention	74	19.4*	3.6

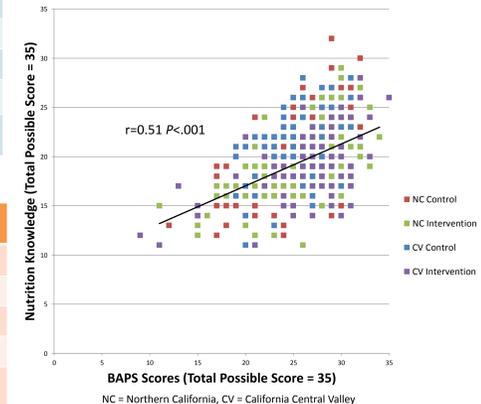
Total possible score is 35. * Significant difference ($P<0.05$)

Table 3. Baseline BAPS Scores (n=481)

	n	Mean	SD
Northern California Control	134	25.9	4.0
Northern California Intervention	175	25.7	4.1
California Central Valley Control	98	25.8	3.0
California Central Valley Intervention	74	26.6	5.0

Total possible score is 35.

Relationship between Nutrition Knowledge and Science Process Skills (n=464)



PRELIMINARY QUALITATIVE RESULTS

SHCP Educator Observations

- Students are developing knowledge of nutrition concepts and science process skills allowing them to solve nutrition-related problems.
- Garden-based activities boost student engagement in the curriculum content.

Teacher Observations

- Students are learning the concepts and enjoying the activities; students asked for salad with in-class pizza parties.
- Parents communicated to teachers that their children have asked to assist with dinner preparation as a result of the cooking demonstrations.

CONCLUSION

The moderate correlation observed between nutrition knowledge and science process skills is consistent with the SCT construct of Behavioral Capability. Researchers expect this relationship will be strengthened at follow-up. Preliminary qualitative data suggest that the program is having a positive effect. Effects of SHCP on nutrition knowledge and science process skills will be further evaluated using pre-/post-questionnaires. To provide a more comprehensive view of learning, authentic student work will be analyzed for use of nutrition terms/concepts and science process skills. Focus groups will be conducted with intervention teachers to inform the researchers of teacher perceptions, observations, and attitudes about the SHCP and *Discovering Healthy Choices*.

ACKNOWLEDGEMENTS

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