This document contains the Appendices for the 2013 *Nutrition to Grow On: A Garden-Enhanced Nutrition Education Curriculum for Upper Elementary School Children (Second Edition)* prepared under the direction of the Nutrition Services Division, California Department of Education. The entire publication is available at http://www.cde.ca.gov/ls/nu/he/nrttogrow.asp.

Appendix A

Testing of the Lessons

All the lessons were extensively tested before inclusion in this publication. Once the lessons were drafted, they were taught to a selected fourth-grade classroom to assess the initial clarity of the content and feasibility of the delivery. The lessons were revised using the teacher's and students' comments. The revised lessons were taught shortly thereafter in a different classroom to evaluate all revisions made and reevaluate whether the lessons were clear to another group of students. This review process continued until the authors felt confident about the final content of each lesson. During that time, the lessons were taught in grades three through six to a wide variety of students. Most classes were in regular education, but some were in special education and language immersion. Although the curriculum was not developed solely for use in special-needs classrooms, those students participating in the curriculum activities did seem to enjoy and benefit from the lessons just as much as the students in the regular classes. Once the final version of each lesson was completed, nutrition and gardening professionals reviewed it for accuracy.

The next step in the testing process was an evaluation of the overall effectiveness of the final lessons. The goal was to determine whether the curriculum was effective at improving upper elementary school children's nutrition knowledge and preferences for vegetables. For the purposes of the formal evaluation, nine fourth-grade classrooms were chosen and combined into three groups. One group was taught all the lessons as written here, including the hands-on gardening activities. A second group was taught all the lessons as presented here but did not participate in the hands-on gardening activities. A third group served as the control and did not receive any formal nutrition or gardening education. Students in all three groups were asked a series of questions related to their knowledge of nutrition and preferences for vegetables at three times: prior to the start of the lessons (pretest), immediately following the completion of the lessons (post-test), and six months later (follow-up).

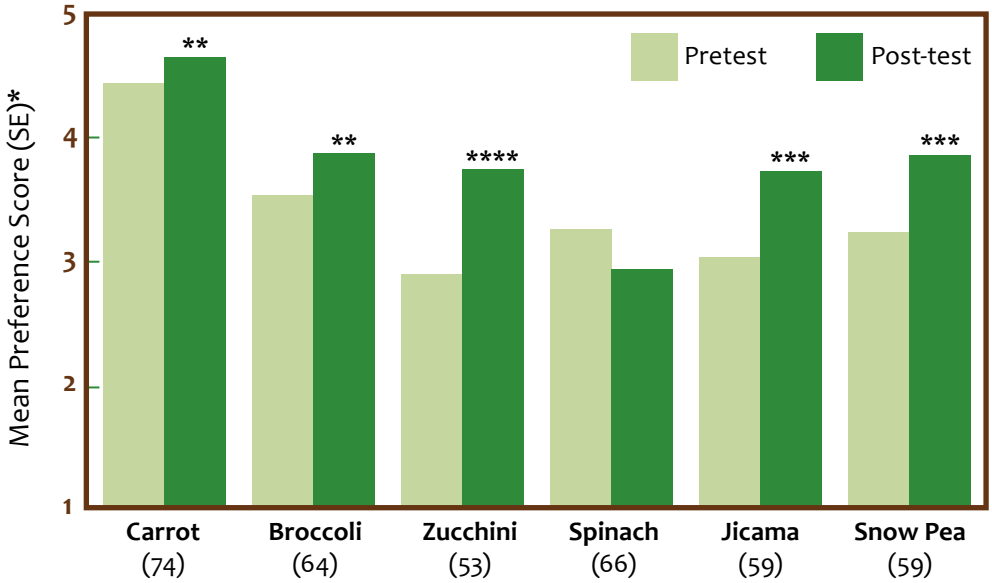
The results were very positive. All students who were taught in this curriculum significantly improved their knowledge of various nutrition topics. Knowledge scores improved by as much as 16 percent between the pre- and post-test periods. Students' increased knowledge was retained up to six months after the lessons had been taught. The control group did not show such improvements. The results regarding students' preferences for vegetables were even more encouraging. The group of students who were taught the in-class nutrition lessons and who participated in the hands-on gardening activities gave significantly higher ratings to five of the six vegetables presented to them. Of the six vegetables, only four were actually grown in the gardens. The students who were taught the in-class nutrition lessons but did not participate in any gardening activities gave significantly higher ratings to only two of the six vegetables presented. (See figures 1 and 2.) The control group showed no significant changes in the students' ratings for any of the vegetables presented.

The results indicate that this curriculum is an effective tool for improving upper-elementary school students' nutrition knowledge and preferences for vegetables. Furthermore, those students who planted, harvested, and tasted their own vegetables in the hands-on gardening activities showed an improvement in their preferences for vegetables above and beyond those of the students in the other two groups. This finding is encouraging because research suggests that food preferences

may predict dietary behavior (Harvey-Berino et al. 1997). In other words, one is more likely to eat something perceived as tasting good. This finding lends additional support to the inclusion of the gardening activities. Details of the study may be found in a publication by Morris, Briggs, and Zidenberg-Cherr (2002).

Figure 1

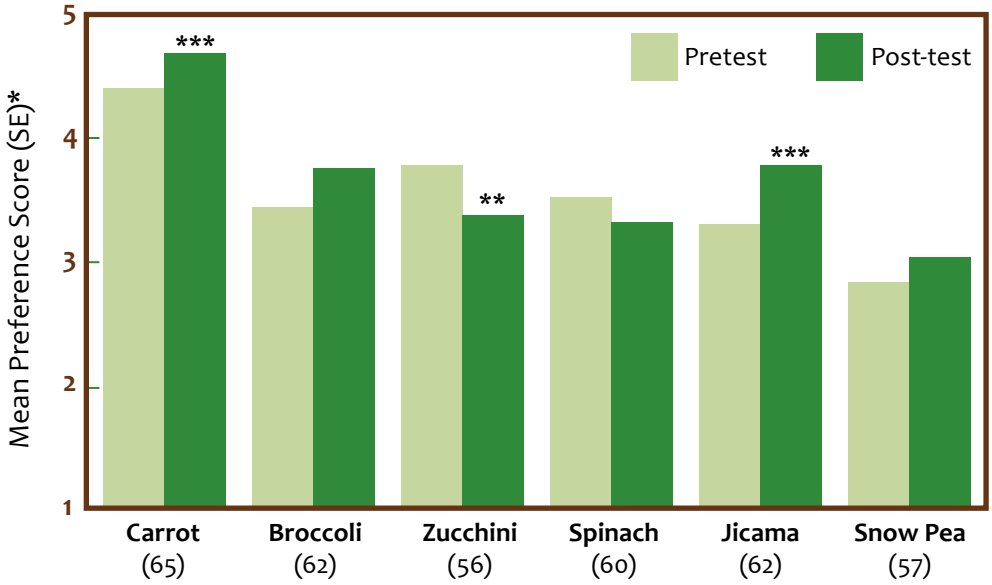
Mean Preference Scores of Students Exposed to Nutrition Lessons and Gardening Activities



* 5 = I really liked it a lot. 4 = I liked it. 3 = It was OK. 2 = I did not like it. 1 = I really did not like it.
** Significantly different from present, $p < 0.05$; *** $p < 0.005$; **** $p < 0.0005$
Note: All but the last two vegetables were grown at the school.

Figure 2

Mean Preference Scores of Students Exposed Only to Nutrition Lessons



* 5 = I really liked it a lot. 4 = I liked it. 3 = It was OK. 2 = I did not like it. 1 = I really did not like it.
** Significantly different from present, $p < 0.05$; *** $p < 0.005$
Note: No vegetables were grown at the school.

Appendix B

Application of Nutrition Education Lessons to Selected California Academic Content Standards

GRADE 4

SUBJECT	STANDARD	Lesson 1	2	3	4	5	6	7	8	9
English–Language Arts	**Reading** 1.1 Read narrative and expository text aloud with grade-appropriate fluency and accuracy and with appropriate pacing, intonation, and expression.		✓							
	Writing 1.4 Write fluidly and legibly in cursive or joined italic.	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Listening and Speaking 1.1 Ask thoughtful questions and respond to relevant questions with appropriate elaboration in oral settings.	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mathematics	**Number Sense** 1.5 Explain different interpretations of fractions, for example, parts of a whole, parts of a set, and division of whole numbers by whole numbers; explain equivalents of fractions. . . .				✓	✓				✓
	3.1 Demonstrate an understanding of, and the ability to use, standard algorithms for the addition and subtraction of multidigit numbers.					✓				
	3.3 Solve problems involving multiplication of multidigit numbers by two-digit numbers.					✓				
	Statistics, Data Analysis, and Probability 1.1 Formulate survey questions; systematically collect and represent data on a number line; and coordinate graphs, tables, and charts.			✓		✓	✓			
	Mathematical Reasoning 2.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.				✓	✓				
Science	**Life Sciences** 2a. Students know plants are the primary source of matter and energy entering most food chains.	✓					✓			
	2b. Students know producers and consumers . . . are related in food chains and food webs and may compete with each other for resources in an ecosystem.	✓								
	2c. Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.	✓	✓	✓			✓			
	3b. Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.		✓	✓	✓		✓	✓		
	3c. Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.	✓	✓			✓		✓	✓	
	Investigation and Experimentation 6b. Measure and estimate the weight, length, or volume of objects.		✓							
	6c. Formulate and justify predictions based on cause-and- effect relationships.	✓			✓		✓	✓		
	6e. Construct and interpret graphs from measurements.			✓						

The matrix identifies the applicable academic content standards that are supported by the lessons.

GRADE 5

SUBJECT	STANDARD	Lesson 1	2	3	4	5	6	7	8	9
English–Language Arts	**Reading**									
	1.1 Read aloud narrative and expository text fluently and accurately and with appropriate pacing, intonation, and expression.		✓							
	2.1 Understand how text features (e.g., format, graphics, sequence, diagrams, illustrations, charts, maps) make information accessible and usable.					✓				
	2.3 Discern main ideas and concepts presented in texts, identifying and assessing evidence that supports those ideas.					✓				
	Listening and Speaking									
	1.1 Ask questions that seek information not already discussed.	✓	✓	✓	✓	✓	✓	✓	✓	✓
	1.8 Analyze media as sources of information, entertainment, persuasion, interpretation of events, and transmission of culture.								✓	
Mathematics	**Number Sense**									
	1.2 Interpret percents as part of a hundred. . . .					✓	✓			
	2.3 Solve simple problems, including ones arising in concrete situations, involving the addition and subtraction of fractions and mixed numbers . . . and express answers in the simplest form.				✓					
	Mathematical Reasoning									
	1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.				✓	✓				
	1.2 Determine when and how to break a problem into simpler parts.				✓	✓	✓			
	2.1 Use estimation to verify the reasonableness of calculated results.				✓					
	2.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.				✓	✓	✓			
Science	**Life Sciences**									
	2b. Students know how blood circulates through the heart chambers, lungs, and body and how carbon dioxide (CO_2) and oxygen (O_2) are exchanged in the lungs and tissues.	✓					✓			
	2e. Students know how sugar, water, and minerals are transported in a vascular plant.	✓	✓							
	2f. Students know plants use carbon dioxide (CO_2) and energy from sunlight to build molecules of sugar and release oxygen.	✓	✓							
	2g. Students know plant and animal cells break down sugar to obtain energy, a process resulting in carbon dioxide (CO_2) and water (respiration).		✓							
	Investigation and Experimentation									
	6a. Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.	✓								
	6g. Record data by using appropriate graphic representations . . . and make inferences based on those data.	✓	✓	✓		✓				

The matrix identifies the applicable academic content standards that are supported by the lessons.

GRADE 6

SUBJECT	STANDARD	Lesson 1	2	3	4	5	6	7	8	9
English–Language Arts	**Reading**									
	1.1 Read aloud narrative and expository text fluently and accurately and with appropriate pacing, intonation, and expression.		✓							
	2.1 Identify the structural features of popular media (e.g., newspapers, magazines, online information) and use the features to obtain information.					✓				
	2.3 Connect and clarify main ideas by identifying their relationships to other sources and related topics.					✓				
	Listening and Speaking									
	1.1 Relate the speaker's verbal communication (e.g., word choice, pitch, feeling, tone) to the nonverbal message (e.g., posture, gesture).	✓	✓	✓	✓	✓	✓	✓	✓	✓
	1.8 Analyze the use of rhetorical devices (e.g., cadence, repetitive patterns, use of onomatopoeia) for intent and effect.								✓	
Mathematics	**Number Sense**									
	2.1 Solve problems involving addition, subtraction, multiplication, and division of positive fractions. . . .				✓					
	2.3 Solve addition, subtraction, multiplication, and division problems, including those arising in concrete situations, that use positive and negative integers and combinations of these operations.				✓	✓	✓			
	Mathematical Reasoning									
	1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.				✓	✓	✓			
	1.3 Determine when and how to break a problem into simpler parts.				✓	✓	✓			
	2.1 Use estimation to verify the reasonableness of calculated results.				✓					
	2.4 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.				✓	✓	✓			
Science	**Focus on Earth Science**									
	5a. Students know energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.	✓	✓							
	5b. Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.		✓					✓	✓	✓
	5c. Students know populations of organisms can be categorized by the functions they serve in an ecosystem.					✓			✓	
	Investigation and Experimentation									
	7d. Communicate the steps and results from an investigation in written reports and oral presentations.	✓	✓		✓		✓	✓		

The matrix identifies the applicable academic content standards that are supported by the lessons.

Appendix C

Class Quizzes

Lesson 1

1. Which part of the plant pulls water and other nutrients out of the soil?
    a. The stem
    b. The leaf
    c. The seed
    d. The root

2. Which part of the plant are we eating when we eat spinach?
    a. The leaves
    b. The flowers
    c. The seeds
    d. The roots

3. Which of the foods noted below is an example of a flower that we eat?
    a. Carrot
    b. Broccoli
    c. Celery
    d. Mango

4. What is the name of the process in which a plant makes its own food by using air, sunlight, and water?
    a. Phototropism
    b. Germination
    c. Photosynthesis
    d. Hydrotropism

Lesson 2

1. Which of the following nutrients provides our bodies with energy?
    a. Protein
    b. Minerals
    c. Water
    d. Vitamins

2. Which of the following nutrients helps our eyes to see in the dark?
    a. Vitamin C
    b. Carbohydrates
    c. Vitamin A
    d. Water

3. Why do our bodies need calcium?
    a. To keep our blood healthy
    b. To keep us from catching a cold
    c. To help our bones and teeth grow and stay strong
    d. To help us see in the dark

4. In which nutrient group is iron found?
    a. Fats
    b. Minerals
    c. Vitamins
    d. Carbohydrates

Lesson 3

1. Which food group does orange juice belong in?
    a. The vegetables group
    b. The protein foods group
    c. The fruit group
    d. The grains group

2. Which of these foods is in the vegetables group?
    a. Carrots
    b. Cheese
    c. Tortillas
    d. Chicken

3. Which food group provides our bodies with a lot of calcium?
    a. The fruit group
    b. The dairy group
    c. The vegetables group
    d. The fats and sugars group

4. Which food is in the protein foods group?
    a. Peanuts
    b. An apple
    c. Rice
    d. Tomato juice

5. From which food groups should we make half our plate?
    a. The dairy group
    b. The fruit and vegetables groups
    c. The protein foods group
    d. The grains group

6. From which food group should we eat the fewest servings every day?
    a. The fruit group
    b. The fats and sugars group
    c. The grains group
    d. The protein foods group

Lesson 4

1. What is the minimum number of servings of fruits and vegetables you should eat each day?
    a. 0 servings
    b. 2 servings
    c. 5 servings
    d. 8 servings

2. Imagine putting one cup of salad on a plate. If you did this, your salad would look about the same size as:
    a. Two ping-pong balls
    b. A baseball
    c. A deck of cards
    d A soccer ball

3. If you eat one medium apple for lunch, how many servings of fruit are you eating?
    a. A half of a serving
    b. One serving
    c. Two servings
    d. Three servings

Lesson 5

1. What do calories measure?
   a. The time that it takes to eat lunch
   b. The length of a hot dog
   c. The energy that food gives our bodies
   d. The weight of a slice of pizza
2. Which food will provide your body with more energy?
   a. Food A
   b. Food B
3. How many more grams of protein are in Food B than in Food A?
   a. 0 grams
   b. 1 gram
   c. 3 grams
   d. 5 grams

Food A

Nutrition Facts

Serving Size 1 Cup (300g)
Servings Per Container 12

Amount Per Serving	
Calories 110 Calories from Fat 30	
	% Daily Value*
Total Fat 3g	**5%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 12mg	**4%**
Sodium 200mg	**8%**
Total Carbohydrate 12g	**4%**
Dietary Fiber 0g	**0%**
Sugars 12g	
Protein 8g	

Vitamin A 5% • Vitamin C 0%

Calcium 25% • Iron 8%

* Percent Daily Values are based on a 2,000 calorie diet.

Food B

Nutrition Facts

Serving Size 1 Cup (300g)
Servings Per Container 12

Amount Per Serving	
Calories 185 Calories from Fat 90	
	% Daily Value*
Total Fat 9g	**14%**
Saturated Fat 6g	**30%**
Trans Fat 0g	
Cholesterol 40mg	**13%**
Sodium 200mg	**8%**
Total Carbohydrate 13g	**4%**
Dietary Fiber 0g	**0%**
Sugars 13g	
Protein 11g	

Vitamin A 4% • Vitamin C 0%

Calcium 20% • Iron 8%

* Percent Daily Values are based on a 2,000 calorie diet.

Lesson 6

1. If you measure your pulse, you will find out:
    a. How many times your heart beats in one minute.
    b. What color your shoes are.
    c. How much water you drank with lunch.
    d. How much you weigh.

2. What should you do before you exercise?
    a. Take a nap.
    b. Eat a lot of candy.
    c. Drink a glass of water.
    d. Do nothing—you can just start exercising.

3. Which of the following is a type of aerobic exercise?
    a. Stretching
    b. Lifting weights
    c. Running
    d. Doing push-ups

4. What type of exercise am I doing when I pick up a heavy shovel while working in the garden?
    a. A mental exercise
    b. An anaerobic exercise
    c. An aerobic exercise
    d. It is not any type of exercise at all.

Lesson 7

1. When should you eat a variety of foods?
    a. Just at breakfast
    b. Just at lunch
    c. Just at dinner
    d. All day long
2. Which of the following is a low-fat healthful snack?
    a. Chocolate chip cookies
    b. French fries
    c. Pretzels
    d. A candy bar
3. Which of the following is an example of being physically active?
    a. Taking a nap
    b. Riding a bike
    c. Watching TV
    d. Riding in a car

Lesson 8

1. What might a company do to get you to buy its food product?
    a. Tell you that the food tastes bad.
    b. Lower the cost of the food.
    c. Give you a free toy when you buy the food.
    d. Make the food smell funny.

Lesson 9

Use the following information to answer the two questions noted below.
For lunch, a young student ate:

2 slices of whole wheat bread

2 tbsp. of peanut butter

1/2 cup sliced banana

1/2 cup carrot sticks

1 cup of applesauce

1 cup of nonfat milk

1. From how many different food groups did this student eat during lunch?
   a. One food group
   b. Three food groups
   c. Five food groups
   d. Six food groups

2. How many ounces of the grains group will this student need to eat to meet the minimum amount recommended?
   a. Two
   b. Four
   c. Six
   d. Nine

Class Quizzes—Answer Key

Lesson 1

1. d
2. a
3. b
4. c

Lesson 2

1. a
2. c
3. c
4. b

Lesson 3

1. c
2. a
3. b
4. a
5. b
6. b

Lesson 4

1. c
2. b
3. b

Lesson 5

1. c
2. b
3. c

Lesson 6

1. a
2. c
3. c
4. b

Lesson 7

1. d
2. c
3. b

Lesson 8

1. c

Lesson 9

1. c
2. c

Appendix D

Nutrition Education Resources

Academy of Nutrition and Dietetics Association

Toll-free telephone number: 1-800-877-1600, http://www.eatright.org/

California Certified Farmers Markets

The Web site provides locations and dates when farmers sell their crops directly to the public.

http://www.cafarmersmarkets.com/index2.html

California Department of Education

A helpful online document produced by the California Department of Education is available free of charge: Nutrition Education Resource Guide, http://www.cde.ca.gov/ls/nu/he/documents/nergcomplete.pdf

CDE Press, Sales Office, 1430 N Street, Suite 3705, Sacramento, CA 95814

Toll-free telephone number: 1-800-995-4099 (8 a.m. to 4:30 p.m., Pacific time), Fax number: 1-916-323-0823,

Contact CDE Press to purchase the following item: Fresh Fruit and Vegetable Photo Cards (Item no. 1365)

California Foundation for Agriculture in the Classroom

This nonprofit organization works with teachers in kindergarten through grade twelve, community leaders, media representatives, and staff in government agencies to enhance education by using agricultural examples. Educational lessons and resources are available.

http://www.learnaboutag.org/

California Healthy Kids Resource Center

The Healthy Kids Resource Center is funded by the California Department of Education and houses a comprehensive collection of health education resources. Teachers, administrators, parents, and other educators working with students from pre- school to high school may borrow these materials at no cost. The center's goal is to promote health literacy among California students.

http://californiahealthykids.org

E-mail address: chkrc@californiahealthykids.org, Toll-free telephone number: 888-318-8188

Dairy Council of California

The council offers free nutrition education curricula for grades kindergarten to grade twelve. It is aligned with the California state education content standards. Lessons use a behavior-change model. A teacher training program is available free of charge online.

http://www.dairycouncilofca.org

1101 National Dr., Suite B, Sacramento, CA 95834-1945

Toll-free telephone number: 877-324-7901

Life Lab Science Program

The Life Lab supports science and garden-based education through publications, professional development, and related programs.

http://www.222.lifelab.org

UC Cooperative Extension

This Web site serves as a point of contact to small farms throughout California.

http://www.ucanr.edu

U.S. Department of Agriculture

The USDA Web site provides resources on health and nutrition, including information about MyPlate, an online tool called the Supertracker to help users plan, analyze, and track their diet and physical activity; and materials that can be downloaded and printed for distribution in classrooms.

http://www.USDAChoosemyplate.gov