



**Cultivating Health And Nutrition through
Gardening Education (CHANGE)**

**Developed by Holly Freishtat, M.S. Nutrition
and the CHANGE staff**

Acknowledgements

It is difficult to designate primary authorship on a curriculum as large and comprehensive as this one. This curriculum has taken three years to develop, pilot and revise and has been an ultimate team effort.

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Elementary Schools Participating in Pilot: Highline and Tukwila School Districts

Salmon Creek	Hazel Valley	Hilltop	Cascade View
White Center Heights	Mount View	Thorndyke	Tukwila

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Message from the Director

The mission of Washington State University King County Extension (WSU KCE) is to make King County a great place to live for all its citizens. Through programs that address the health of natural systems, agricultural resources, and people, we are enriching lives and communities.

WSU KCE is making strides to create a healthier, more sustainable food system for King County through the development of a food policy council, farm to school coordination, hosting an annual Harvest Celebration Farm Tour and through the CHANGE program. We're taking a systems-based approach to improving food access, nutrition education, sustainable farming, food production, processing and distribution, and community and economic development. We believe to effectively address food security requires strong and mutually beneficial connections among all food system stakeholders.

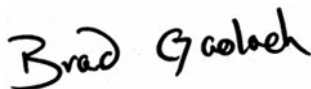
As we move closer to our vision of a healthier, regional food system, we recognize an essential link is educating children to discover the source of food, to know how food nourishes them, and to learn how to make healthier food choices. The Cultivating Health And Nutrition through Gardening Education (CHANGE) curriculum teaches nutrition through gardening and cooking, helping children discover their own personal connection to healthy food, good nutrition and the natural world.

The CHANGE curriculum is an innovative curriculum for elementary school students to learn nutrition. In addition to teaching nutrition and health these lessons integrate the disciplines of science, math, language arts, and environmental studies. They also reinforce the state's academic content standards.

The connection between children growing vegetables, cooking them and choosing healthful food has been seen in the work of CHANGE in the schools. This connection is all the more important given findings that children's current dietary habits do not meet national recommendations. Poor eating habits and physical inactivity learned during childhood often extend into adulthood, contributing to our current epidemic of obesity, obesity related illnesses, and preventable deaths among adults. Educating our children in effective ways through curriculum like CHANGE is paramount in making positive change in our future.

Many people, including educators, gardeners, students, principals, and parents, helped to develop this exciting curriculum, and I would like to thank them for all their hard work. I hope you find these materials useful and fun to implement.

Sincerely,



Brad Gaolach, PhD
Director

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Unit 2

1. Making Healthy Food Choices
2. Growing with Protein
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4. You're the Chef: Bean Wraps
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How to Use the CHANGE Curriculum

Need:

With the epidemic of overweight and obesity on the rise, especially among children and low-income populations, it is crucial that we continue to develop innovative strategies to teach nutrition and encourage healthy lifestyle habits. To effectively address the issue of childhood overweight, it is important for youth to make dietary choices based on genuine excitement for healthy foods and good health. We do not want to create a generation of youth who feel guilty about their health; rather, we want to empower them to make healthy choices through excitement about food and physical activity.

There are a plethora of nutrition curricula and garden-based curricula available to K-12 teachers and educators, but the curricula that teach nutrition through gardening and cooking are limited. Cooking and gardening are methods that excite and inspire students to learn about food and nutrition. As gardening and the seasonality of produce are regionally distinct, this curriculum addresses the need for a garden-enhanced nutrition curriculum that reflects the growing conditions of the Pacific Maritime Northwest.

Using a garden-based nutrition curriculum is a relatively new approach to teaching urban youth about whole foods cooking and nutrition. However, some recent research indicates that it is a promising approach. Morris and Zidenberg-Cherr found that a garden-enhanced nutrition curriculum in California improved knowledge about healthy eating and increased the consumption of certain vegetables in fourth graders, and Berti et al found that a variety of gardening interventions were useful in improving adult nutrition in Canada.

Objectives of Curriculum:

The two main objectives of this curriculum are:

- 1) To teach elementary students how to make healthy food choices through experiential learning and
- 2) To improve students' preferences for fruits and vegetables through gardening and cooking.

Theoretical Principle:

This curriculum is based on the Social Cognitive Theory (SCT), which states that students' behavior is influenced by knowledge, behavior, and environmental factors (Bandura). Positive interactions between these three factors are believed to influence health behavior and increase the likelihood of behavioral change (Baranowski et al).

This curriculum provides experiential cooking and gardening activities in which students are divided into small groups, allowing all students to participate in activities. The repetition of planting, growing, harvesting and cooking with healthy foods provides an excellent foundation of knowledge in each child. The environmental factors to which students are exposed greatly influence their behavior. In this curriculum, classroom and school gardens are created and maintained by the students; becoming a constant visual reinforcement of the source of healthy food and building on the principles of SCT. The continuous interaction between nutrition and gardening knowledge, and cooking and gardening activities are the hallmarks of this curriculum. When these practices are present in classrooms and schools, especially over multiple years, students are inspired to make positive health behavior changes.

Methodology:

In the past three years, Washington State University King County Extension (WSU KCE) CHANGE (Cultivating Health And Nutrition through Gardening Education) developed a 20-lesson garden-enhanced nutrition curriculum for grades 1-3 and for grades 4-5 in collaboration with teachers from the Highline and Tukwila School Districts. CHANGE teaches healthy eating through gardening- and cooking-enhanced nutrition education.

The CHANGE curriculum was piloted, revised, and taught in over 185 classrooms for three years. We have incorporated teacher input through feedback sessions and extensive evaluations. In this time, we have learned that teachers will take initiative in teaching nutrition through gardening and cooking when they have support and curriculum materials to use.

WSU KCE CHANGE hosted a four-day Garden-Enhanced Nutrition Teacher Institute where teachers and educators peer-reviewed the CHANGE curriculum. The participants of this institute included six teachers from the Highline and Tukwila School Districts, two nutrition educators, and one WSU staff horticulturist. Most teachers who participated in the Teacher Institute have participated in CHANGE and therefore have expertise in the implementation of these lessons.

As part of the curriculum review process, the teachers, horticulturist, and nutrition educators reviewed and edited the curriculum, including overall structure and format, nutrition, gardening, and cooking aspects. The following components were reviewed:

- **Overall Structure and Format:** includes alignment to the Essential Academic Learning Requirements (EALR), Grade Level Expectations (GLE) for grades 3-5, background materials and supplemental activities for teachers, and English Language Learner (ELL) appropriate activities.
- **Nutrition Content:** is based on the US Department of Agriculture 2005 Food Guidance System guidelines, and includes fiber, micro- and macro- nutrients, dietary guidelines, food labels, and analyzing and creating healthy food advertisements.
- **Cooking-enhanced nutrition:** includes methods of cooking in the classroom and appropriate graphic recipes for students and their families.
- **Garden-enhanced nutrition:** includes methods for integrating science and math into the CHANGE curriculum using gardening and nutrition.

Curriculum Framework:

Educators

This curriculum was developed for use by WSU KCE Educators. Educators are trained in advanced nutrition and gardening. You may find it helpful to read or gain further education on certain lesson concepts before teaching the lessons. In some cases, background information is provided within the lesson or attached lesson materials.

CHANGE was developed with the understanding that there would be two adults in the classroom: one being the educator who delivers the lesson, and the other being the classroom teacher. The educator's role is to prepare and teach the lessons, and the teacher's role is to assist during the lessons. You will see these roles referred to throughout the curriculum; however, we understand that this model may not work for your classroom. The educator and teacher roles can be one and the same, but please be aware that certain lessons will require an assistant in the classroom.

Methods

Through teacher input and years of experience we instituted a variety of methods to enhance the delivery of the lessons. You may wish to incorporate these as you use the CHANGE curriculum.

Learning teams:

Our lessons teach experientially through cooking and gardening activities. For these activities, we break the class into learning teams of four to six students. The learning team model allows each student to have hands-on experience in each of the activities presented in the lessons. This engages all students to focus on the task at hand and encourages teamwork and cooperation among students. This model also facilitates classroom management. A classroom of 25 students is easier to manage in small learning teams.

Learning contract:

The goal of the learning contract (fig. 1) is to establish learning and behavior guidelines with students. Once guidelines have been established, each student signs her/his name to the learning contract. This contract also serves as a teaching tool, providing a visual reinforcement of concepts taught in CHANGE lessons. The contract has either a plant with all six plant parts (Plant Part Poster) or an outline of a person (Healthy Person Contract), depending on which unit is being taught. Throughout the lessons the learning contract is used to review these rules before each cooking and gardening activity. It is also used as a tool to discuss the previous lesson's concepts, and to reinforce and expand upon new ones.

Integration with existing curricula:

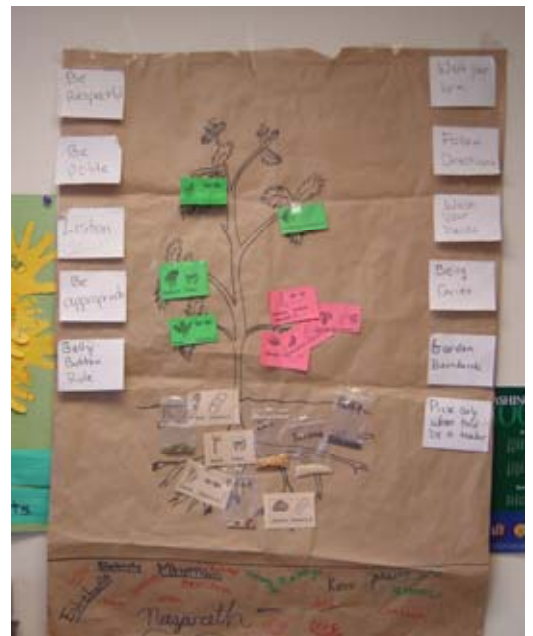


Figure 1. Plant Part Learning Contract

Schools in Washington State require teachers to use a specific set of standards in their teaching. In order for this curriculum to be successful in schools we felt it was important to align it to Washington State's EALR and GLE guidelines. This curriculum requires students to use math, science, reading, and writing skills to successfully complete cooking and gardening activities. It also facilitates the integration of nutrition education into daily teaching, within the existing curriculum set forth by the state. Therefore, adding CHANGE lessons to a classroom builds on existing standards while incorporating new concepts about healthy eating and living.

Adaptability for Teachers, Community Educators, and Parents:

This curriculum is meant to be adapted. It was developed to meet the specific needs of our organization, schools, and students. Since all classrooms are unique, it is expected that you will adapt these lessons to meet the needs of your students. In our classrooms the lessons are taught in chronological order, allowing lessons to build on one another. However, each lesson has enough can be taught on its own, or be broken into its individual activities, and still provide great knowledge about nutrition, cooking, and gardening.

Though our curriculum is written for grades 1-5, we have adapted it to teach in many kindergarten classes. Many of the activities will need to be modified if you are planning to teach at this level, but don't let the absence of a K from the headings deter you! In fact, in the *Preparation Outline* of each lesson plan, you will find a section noting changes you can make when teaching a kindergarten and/or ELL class.

Organization of the Curriculum:

The curriculum is composed of 40 lessons in 2 units. Each unit contains 10 lessons for primary (1-3) grades, and 10 lessons for intermediate (4-5) grades. We teach 1 unit a year to each grade group. We train our educators on three to four lessons at a time. In turn, they train the teachers in 30-60 minute trainings, highlighting teacher responsibilities, lesson concepts, follow-up activities, and logistics for classroom material set up. Thus, the educators and teachers receive three separate trainings in order to deliver a 10-lesson unit.

Each lesson takes about 60 minutes to conduct. In a four-week period, we teach three lessons, and use the fourth week to conduct make-up lessons as needed due to educator absence or class field trips. We also use the fourth week to train educators on the next three lessons.

Our program is set up to teach grades 4-5 in the fall and grades 1-3 in the spring. We teach in this order because primary teachers indicated to us that their students weren't ready for the program in the fall, but by mid-winter they were prepared for the concepts addressed in the CHANGE program.

This information is provided to highlight one framework that has been successful in the implementation of this curriculum. Please use the curriculum in the way that best suits the needs of your class.

Organization of the Lesson Plan:

There are 6 sections in each lesson plan:

Outline of Lesson: Includes the time it takes to deliver the lesson, an outline of lesson content, student learning objectives, and references used to develop the lesson.

Overview (for Teacher): This is the most important page for the teacher to read prior to the lesson. It explains the teacher's role before, after, and during the lesson. An example of the Overview with an explanation of each section is provided in Table 1.


EALR & GLE Alignment: Teachers have aligned the lessons to EALRs and GLEs based on state standards for grades 3-5.

Preparation Outline: This section is a list of activity supplies and quantities needed to teach the lesson, including overheads, handouts, and any changes that need to be made when teaching kindergarten or ELL classes.

Lesson Content: Each lesson begins with an overview of lesson topics, followed by the lesson activities, and ends with review and reflection activities. The review is located at the end of each lesson rather than at the beginning of the following lesson so that lessons may be taught in any order.

Lesson Materials: This section includes overheads, handouts for the teacher and students, and supplemental activities for the teacher.

Table 1. Sample Overview (for Teacher) with section explanations

Overview (for Teacher)	
Pre-Class Preparation	This section lists tasks to be completed before the lesson begins, including discussions on concepts that will be addressed in the lesson or simple tasks such as organizing the classroom into learning teams.
Teacher Involvement During Class 	The apple symbol in the left-hand column is used throughout the lesson to denote action required by the teacher. If you are assuming both the teacher and educator roles, this section will help you decide whether you need to enlist an assistant.
Post-Class Teacher Responsibilities	This section lists the tasks that need to be completed after the CHANGE lesson. These can be as simple as handing out a healthy snack or visiting the garden to water plants.
Vocabulary	A list of vocabulary words used in the lesson that can be introduced to students before the lesson to prepare students for

	lesson concepts, or during reflective activities.
Critical Thinking Activity	Critical thinking activities generally occur during hand washing exercises, keeping children occupied while the educator prepares materials for the cooking activity.
Supplementary Activities	A list of activities that can be conducted by the teacher to further explore concepts discussed in the lesson.
Web Resources	A list of websites for more information on the concepts discussed in the lesson.
Suggested Books for Reading in the Classroom	Suggested books for teachers to share with their classes, relating to concepts covered in the lesson.

Assessment:

Several forms and levels of assessment are incorporated into this curriculum.

Teacher assessment of the curriculum is conducted through written evaluation, individual input, group feedback and brainstorming. Improvements to the curriculum have been, and will continue to be driven and inspired by teachers.

Teachers can assess student knowledge using the student assessment assignments located in the lesson materials section of most lessons.

References:

1. Morris J, Zidenberg-Cherr S. Garden-enhanced nutrition curriculum improves fourth-grade schoolchildren's knowledge of nutrition and preferences for some vegetables. *J Am Diet Assoc.* 2002; 102:24-30
2. Berti PR, Krusevec J, FitzGerald S. A review of the effectiveness of agriculture interventions in improving nutrition outcomes. *Public Health Nutr.* 2004 Aug;7(5):599-609
3. Bandura A (1986). *Social Foundations of Thoughts and Action.* Englewood Cliffs, NJ: Prentice Hall. Chapters 1 (Models of human nature and causality, pp. 1-46) & 7 (Vicarious motivators, pp. 283-334)
4. Baranowski T, Perry CL, Parcel GS. How individuals, environments and health behavior interact: Social Cognitive Theory. Chapter 8 in K. Glanz, B.K. Rimer, & F.M. Lewis (eds.). *Health Behavior and Health Education: Theory, Research and Practice.* 3rd Ed. San Fran, CA: Jossey-Bass, 2002

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Funded in part by USDA-Food Stamp Program, state and local government agencies.

How to Use CHANGE with Food Stamp Nutrition Education (FSNE) Funding

CHANGE is a garden-enhanced nutrition education curriculum. Agencies wishing to use this curriculum to educate people eligible for the Food Stamp Nutrition Education Program can use the following information to guide their activities.

According to the US Department of Agriculture in their Food Stamp Nutrition Education Plan Guidance document for the year 2007:

Gardening is a beneficial project that leads to the economical production and consumption of healthy and fresh food. The provisions of 2 CFR 225 (OMB Circular A-87) allow USDA/FNS to make a reasonable judgment as to what is necessary and reasonable to deliver nutrition education. *The cost for the rental or purchase of garden equipment (fertilizer, tractors), the purchase or rental of land for garden plots, seeds, plants, and other gardening supplies are not allowable FSNE costs. Only educational supplies, curricula and staff salaries to teach gardening concepts that reinforce the beneficial nutrition aspects of gardening are allowable costs.* (Note that participants may use program benefits (coupons/EBT) to purchase seeds and plants for gardening purposes).

Throughout the lessons in this curriculum, materials that can not be purchased with FSNE funding are clearly indicated with the following symbol and wording:

⊗ *Items marked with this symbol may not be purchased using FSNE funding, nor included as part of cost share.*

Activities that can not be claimed for cost-share time are clearly indicated with the following symbol and wording:

⊗ *This activity may not be conducted by FSNE funded staff, and may not count toward FSNE cost-share time.*

For more information about the Food Stamp Program, FSNE eligibility and funding, visit the National Food Stamp Nutrition Education website at:

http://www.nal.usda.gov/foodstamp/National_FSNE.html

How to Cook in the Classroom

Through our experience cooking in over 100 classrooms, we have found certain strategies and practices to be especially effective.

Practices:

Gloves: Check with your state/county Department of Health regarding the use of gloves. Washington State Department of Health Chapter 246-215 WAC states “No bare hand contact with ready to eat foods.” Be sure to check local health regulations that may apply to your classroom activities.

Hand washing: During the first lesson of each unit we teach the importance of hand washing and how to properly wash hands. Before each cooking activity we review these concepts and then wash hands. The repetition before each cooking activity helps reinforce the behavior, and we hope the students will practice food safety when they are at home with their families.

Knives in the classroom: Each school receiving this program has given us permission to bring what we call “kid” knives into their classrooms. We make sure the students understand that the privilege of using knives in CHANGE classes will be taken away if they do not follow strict rules for handling the knives. We discuss the importance of knife safety in every cooking lesson, and demonstrate to the class how to handle knives in a safe manner when chopping fruits and vegetables.

Types of knives: We have used a variety of knives; each type has had advantages and disadvantages. Plastic butter knives are very affordable but hard to cut raw fruits and vegetables. Sandwich spreaders are sharp and can cut any fruit or vegetable, but because the blade is small and round it is hard for students to manage. Plastic lettuce knives or “kid” knives look just like a real chef’s knife and they cut well. Although they are more expensive they are easier for the students to manage because they have large handles and a large blade, with a tip to anchor them. This allows the students to place one hand on top of the blade while grasping the handle with the other hand, providing stability and ease of use.

Cooking behaviors: During the first lesson of each unit we discuss appropriate behaviors during cooking activities as a class. Topics include knife safety, polite eating, being helpful (especially with clean-up), trying new fruits and vegetables, etc. The rules established by the classroom are posted on a learning contract that everybody signs. This helps hold the students accountable for their behavior during CHANGE classes.

Strategies:

Pre-preparation of food: We serve over 40 classrooms a week in 8 different schools. In order to save money and time we prepare our food in a centralized kitchen in the morning before that day's scheduled classes. Due to the large size of our program we are able to buy the majority of our food directly from local farms, strengthening the farm-to-school connection. You may need to adapt the recipes to fit your classroom/program size and budget.

Food Storage and Transport: Once the food has been prepped it is stored in refrigerators until it is transported to the classroom. The food is packaged into large, insulated carrying coolers with frozen ice packs. Some schools will allow us to store food in a school refrigerator during the day, providing they have the room.

Cooking trays: The most effective way to have a classroom of 25 students cooking simultaneously is to use cooking trays (Fig. 1). Each learning team receives a plastic tray containing all the ingredients in the recipe, the necessary cooking utensils (measuring spoons, kid knives, cutting boards, etc.), and a graphic recipe in a plastic sheet cover for the students to follow. **The list of contents for each cooking tray is provided in the Preparation Outline of each cooking lesson.** The cooking trays are effective because they reduce the amount of commotion in the



Figure 1. Cooking tray with plastic kid knife, cutting board, grater, measuring cups and spoons, bowl and stirring spoon

classroom; students have all the necessary ingredients at their desks and do not need to get up for

supplies. The trays also help keep students' desks clean. Food scraps and dirty cooking utensils go back on the tray and then are carried to the trash or sink area to be cleaned. The learning team approach provides an opportunity for all students to participate in the activities, encouraging them to cooperate and work as a team. While we recommend using cooking trays, they do have disadvantages. Cooking trays increase the cost of materials (since one set of equipment is needed for each group), and the amount of time spent on food preparation and the cooking activity itself.

This approach meets the needs of our students and classrooms and fits our budget, but there are ways to adapt this style to meet your specific needs. One option is demonstration, rather than experiential teaching. In this approach, the educator prepares a recipe in front of the class while students watch. The educator can call on students to help with tasks. This approach reduces the amount of cooking materials and time needed to prepare and complete the activity.

Graphic Recipe: The graphic recipes used in this curriculum were developed for several reasons. 1) We teach many students who are learning English as a second language. 2) We work with grades 1-5 and require recipes that allow for different levels of reading comprehension. 3) The students take recipes home to prepare with families who may not speak or read English.

The CHANGE curriculum uses graphic recipes in a chart format with three columns. The first column is an ingredient list with a picture of the food next to the name. The second column is a list of directions with a picture of the kitchen utensil being used. The third column states a key nutrient contained in each food, and shows a picture of the part of the body that nutrient benefits. Many versions of graphic recipes have been developed, but the nutrient column makes ours unique. This strengthens the cooking component by visually reinforcing the nutrition concepts taught in the lesson, and reaching students with different learning needs. For a list of nutrient symbols and explanations, see Appendix A.

We have developed two versions of the recipes. The first is for students to prepare in learning teams. This recipe was written to provide a small taste for each student and therefore the recipe serving size is very small. The second recipe was written for families to prepare as a side dish to serve 4-6 people. Each family recipe contains a food label. The food label is an accurate nutritional analysis for 1 serving of the family recipe. The graphic recipe and food label can be used as a teaching tool for the student with her/his parents to discuss the key nutrients in the recipe and how they help our bodies. An example of the graphic recipe and food label can be found in Appendix A.

Teaching the recipe: For both primary and intermediate levels, we emphasize team learning. We introduce the recipe to the entire class on an overhead, and then break into groups to cook. The age and grade level of the students will determine the instruction approach and time necessary to introduce and complete the cooking activity.

Step 1: Put the recipe on the overhead for all students to view. If cooking is new to students, explain that all recipes have two parts: ingredients and directions. CHANGE recipes are unique because they have a third part that shows the relationship between nutrient content and health.

Step 2: Show students how to read a recipe by putting a finger on each item, then read how much to use, and how to use it.

Step 3: Demonstrate every step of the recipe using tools and ingredients. Explain how to read a measuring cup and a measuring spoon, and show them how to fill it exactly to the line. Use hand gestures to demonstrate mixing, tossing, flipping, etc., and have the class use their hands to act out these cooking directions. Suggest ways that they can help each other, and remind them to always go back to the recipe if they have questions about what to put in or how much to use. Be specific when showing them how to cut up different ingredients with care.

Step 4: Conduct the call and response activity, calling out the ingredient, the key nutrient, and the key body part benefiting from that nutrient.

Cooking with grade 1-2 students involves a more detailed explanation of steps and one-on-one assistance, and this takes more time. With grades 3-5, we demonstrate all steps

for the first cooking lesson only. In follow-up cooking lessons, the intermediate students are encouraged to learn and problem-solve in their teams. The curriculum describes a call and response activity for learning nutrient benefits, and this has worked well for all grades.

Cooking Cards: Cooking cards are small note card-sized instructions for the students to follow. Each ingredient in the recipe is typed on the front of the cooking card, and the directions are typed on the back. The 1-2 grade and ELL students use cooking cards with more pictures and fewer words, and 3-5 grade students use cards with fewer pictures and more words. Each learning team has their own set of cooking cards. The educator visits each team with a set of jobs, and each student pulls one card. The cooking card they select denotes their job for the cooking activity.

Clean up:

Each cooking activity includes clean-up time. We encourage the students to clean as they go to reduce clean-up time at the end of the lesson. As students wait to do their job they are asked to help their team by cleaning up their area. Once the cooking activity is finished there is time allotted to clean dishes. Most students are happy to help out. We are fortunate to have sinks in most of our classrooms allowing us to clean all dishes before leaving the classroom. In the classrooms that do not have sinks all cooking materials are wiped of food waste and stacked into a pile to be washed in the staff/teacher lounge.

Appendix A

- Nutrient Symbols Used in CHANGE Recipes
- Sample Graphic Recipe
- Sample Food Label

Nutrient Symbols Used in CHANGE Recipes



Protein: a nutrient found in food that helps our body grow, helps cuts heal, and builds strong muscles. Animal sources of protein include fish, chicken, and eggs. Plant sources of protein include beans, nuts, and seeds.



Fiber: a part of foods such as whole grains, beans, fruits, and vegetables that passes through the body but is partially digested or not digested at all.



Vitamin A: a nutrient found in food that helps our eyes see at night and helps us fight off disease. Animal sources of vitamin A include cod liver, eggs, butter, and fortified milk. Some examples of plant foods that have vitamin A include sweet potatoes, carrots, cantaloupe, squash, and dark leafy greens.



Vitamin C: a nutrient found in food that helps us heal wounds by making collagen, helps our gums stay healthy, and is an antioxidant. Antioxidants prevent damage to our body cells from free radicals that can form in our bodies due to exposure to toxins and pollutants. Fruits and vegetables are good sources of vitamin C, especially oranges, red peppers, tomatoes, broccoli, and strawberries.



Potassium: a mineral found in food that keeps the heart healthy. It can prevent high blood pressure and stroke. The richest sources of potassium are fruits and vegetables, especially bananas, tomato sauce, potatoes and orange juice.



Calcium: a mineral found in food that is used for building bones and teeth and in maintaining bone strength. Animal sources of calcium include milk, cheese, and yogurt. Plant sources of calcium include bok choy, kale, white beans, and Chinese cabbage.













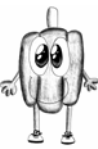








Carbohydrate: One of the substances in foods that gives you energy. Plant foods are the best source of carbohydrate. Some examples are whole grains (whole wheat bread, brown rice, oatmeal), fruits and starchy vegetables like peas, corn and potatoes.

References:
www.mypyramid.gov
<http://lpi.oregonstate.edu>

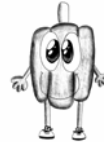
Fruit Kebabs for the Family

Makes 8 kebabs

	Ingredients	Directions	Nutrients
Slice	Banana 	Peel and slice 1 banana. 	Potassium 
Slice	Kiwi 	Slice 1 kiwi into 4-6 large chunks. 	Vitamin C 
Chop	Pear 	Chop 1 pear into bite sized pieces. 	Fiber 
Slice	Cucumber 	Peel and slice ½ of a cucumber. 	Fiber 
Slice	Red or Green Pepper 	Chop 1 red or green pepper into bite size pieces. 	Vitamin C 
Stack	Stack Cut Up Fruit	Stack cut up fruit on straws or kebab sticks. 	All of the above Nutrients
Dip	Vanilla Yogurt 	Place a spoonful of yogurt on each person's plate for dipping kebabs. 	Calcium 



Fruit Kebabs



Nutrition Facts

Serving size: 1 Kebab (94g)

Servings Per Recipe 8

Amount Per Serving

Calories 50 Cal. from Fat 3

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Cholesterol 1mg **0%**

Sodium 12mg **0%**

Total Carbohydrate 11g **4%**

Dietary Fiber 2g **8%**

Sugars 7g

Protein 1g

Vitamin A 2% Vitamin C 40%

Calcium 4% Iron 0%

* Percent Daily Values is based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

How to Garden in Schools

Growing vegetables is an important component of the CHANGE curriculum. We use indoor and outdoor gardens to teach about growing food, and each provides distinct opportunities to make nutrition fun, and to integrate nutrition into science and math curricula.

⊗ *Materials used to build or maintain indoor gardens may not be purchased using FSNE funding, nor included as part of cost share.*

Indoor Gardens (see Appendix B)

In each of our classrooms the students create, maintain, and harvest from an indoor garden. Growing food indoors allows for a longer growing season, because vegetables can be grown through the winter. Indoor gardens are an excellent experiential tool that can integrate nutrition into science and math through activities such as measuring and charting the growth of food plants, and conducting experiments to compare different growing conditions. The indoor garden provides visual reinforcement of the concepts taught in CHANGE classes and, most of all, provides healthy foods that children can snack on.

Method:

Over the last three years we have experimented with several methods of indoor gardens and have found the greatest success using plastic milk jugs as growing containers (see figure 1) and fluorescent shop lights for artificial light. PVC light racks can be easily constructed to support the lights (see figure 2). Each classroom has one 4-foot light and light rack with 12 plastic milk jugs tightly tucked under the light. This set-up creates a bountiful garden for the classroom to enjoy throughout CHANGE lessons. The indoor garden sets limitations for what can be grown and how large it can grow. Considering this, we select seeds such as lettuces, kale, radishes, chard, beet greens, bok choy and baby turnips to grow in our indoor gardens. These plants grow quickly and do well in small spaces, while providing enough harvest for several salad bar parties that the students can enjoy.



Figure 1. Radishes, kale, lettuce, and bok choy growing in plastic gallon jugs.



Figure 2. PVC light rack with shop lights and gallon jug planting containers

Ways to Adapt:

- Instead of a grow light, seeds can be planted near a window. They will grow for a week or two before losing vigor and dying. However, there are plenty of lessons to learn in that time.
- Growing containers: plastic seed trays, four and six-pack seed trays, and recycled milk cartons have all worked well in the past. Egg cartons have not worked well, as the cardboard leaches nitrogen out of the soil and the seedlings suffer.
- You can build a light rack out of wood instead of PVC. We use PVC light racks because they are easy to transport and store, and last a long time. In the past, we have built light racks out of 2" x 4" pieces of wood. The advantage of using wood is that the initial cost for wood and hardware (screws, brackets) is only about \$5, whereas the cost of the materials for the PVC light rack, purchased at our local hardware store, is about \$20. The disadvantages of the wood light rack are that it is heavy, more cumbersome to transport, and can rot or warp over time.

Teaching Strategies:

Just as the cooking activities are taught in small learning teams of 4-6 students, so are the gardening activities. This creates the same advantages and disadvantages as stated in the cooking in the classroom section. During classroom garden activities our goal is to keep students interested and engaged. Two styles of teaching have worked well in our classrooms and each is dependent on the age and grade level of the students.

- **1st and 2nd grade**

Set up the gardening materials in the classroom where students can watch the demonstration. Write gardening jobs on the board with a number assigned to each job. Next, assign each student a corresponding number. When assigning numbers, have each student make the number with their fingers and hold it to their chest so they won't forget their number. Call on the number 1's to hold their hands up in the air. Explain their job and then demonstrate it for the whole class to watch. Go through each of the jobs in the same manner until all jobs have been demonstrated and each student understands her/his job. As the gardening activities take place, walk around and observe each group. Always keep the seeds with you and have students raise their hands when they are ready for seeds. No matter how hard the students try, it is hard for them to restrain themselves from planting all the seeds in a seed packet if they are unsupervised. Oversee them as they count seeds and plant them.

- **3rd grade-5th grade**

Set up the gardening materials in the classroom where students can watch the demonstration. Write gardening jobs on the board and assign each of them a number. Demonstrate all the jobs in front of the students. Encourage the students to work together as a team to decide who is doing what job within their learning teams. Explain that the team cannot start the gardening activity until everyone has been happily assigned a job. If working with ELL classes, the 1st - 2nd grade approach has been very helpful in keeping students on task and completing their gardening activity.

Ways to Adapt:

- Gardening cards: Gardening cards are small note-card-sized instructions for the students to follow. The job name is printed on the front, and directions on the back explain how it should be done. The 1-2 grade and ELL classes use gardening cards with more pictures and fewer words, and 3-6 grades use cards with fewer pictures and more words. Each learning team has its own set of gardening cards. The educator holds the stack of cards upside down in her hands and has each student pull one card. The gardening card that the student pulls is their job for the planting activity.
- Complete the gardening jobs together as a class. Assign each job a number and assign each student a number. Demonstrate the first job and then have all the number 1's complete this job together. After the number 1's complete their job they pass the growing container to the number 2's. Demonstrate number 2's job and then have all the number 2's complete the job. Continue this same style until all jobs have been completed.

Hand Washing:

Students are taught the importance of washing hands after gardening after activities, and the proper technique for washing hands after each indoor and outdoor gardening activity.

Outdoor Gardens (see Appendix B)

The outdoor garden provides a direct link to a healthy food system at each school where CHANGE lessons are taught. It also provides another experiential tool to facilitate the education of nutrition and gardening. Growing food outdoors allows the students to have a better understanding of agriculture, soil health, plant lifecycles, and seasonality. The school garden creates valuable lessons in community involvement and empowers the students to live healthy lifestyles through physical activity and increased fruit and vegetable consumption.

Methods:

In many of the new schools CHANGE works with, we start our outdoor gardens with 32-gallon plastic tubs. This is necessary for schools that have no accessible garden space near the school. The tubs have holes drilled in the bottom for drainage and are then filled with a 2" layer of round drainage rocks and the remainder with soil. The soil should have good drainage and be nutrient-rich. The soil mix used should be up to 1/4 sand (for drainage), up to 1/3 top soil (for nutrients), and approximately 1/2 compost (for nutrients and water retention). Plastic tubs provide a quick, affordable method of installing a school garden; however, they require more daily maintenance. The plastic tubs need to be watered more often because of the limited amount of soil from which plants can draw water.

When creating a more permanent space for a school garden consider sunlight, a nearby water source, accessibility from the classrooms, and size. The garden will need at least 6 hours of direct sunlight each day for plants to grow successfully. Choosing a site close to the school building and classrooms allows the students and teachers more opportunities to visit the garden and to integrate it into classroom activities. It also

provides an added measure of security and helps keep the garden safe from vandalism from outsiders and other students. One of the most important considerations when starting an outdoor garden is size. A common mistake is to make the garden too large. A large garden is often too much for the students and teachers to maintain and they quickly lose interest. Consider the number of classrooms and students involved with the CHANGE lessons and design your garden appropriately. Remember, you can always expand in the future!

At CHANGE, we require all potential garden locations to have a soil test. This helps us determine what nutrients are needed, levels of contaminants (if any), and if this is a healthy soil that will grow healthy plants. Once the site is chosen the design is created. All of our gardens consist of raised beds whether they are constructed out of wood or piled up with dirt (see Appendix B). Raised beds help keep the soil from being compacted, and promote healthy soil. They also provide boundaries by keeping the students from walking in the garden beds and harming the plants.

Growing food outdoors requires a knowledge of seasonality. Please refer to the Seattle Tilth publication “The Maritime Northwest Garden Guide” as an abundant source of information related to what grows well in this climate and when to grow different fruits, vegetables, flowers, and herbs. Contact your local Cooperative Extension’s Master Gardener Program with any questions or concerns regarding garden set-up, plant cultivation, or garden maintenance.

Teaching Strategies:

During the first lesson of each unit we have a classroom discussion about appropriate behaviors during outdoor gardening activities. Examples include the belly button rule (to avoid injuries, no tools can go above the belly button), teamwork, no picking plants unless you ask the teacher, no jumping over garden beds, etc. The rules established by the classroom are posted on a learning contract that everybody signs. This allows the students to be held accountable for their actions when acting inappropriately.

Because of the many stimuli that are present once you leave the classroom and go outside, the outdoor garden can be a difficult place to keep the attention of a whole classroom. With experience, we have found that having fewer students in the garden at one time provides a better learning environment for all. In order to maintain a positive learning environment and still have fun, we take only half of the learning teams to the garden at a time, while the other half is doing a different activity. All lessons that include outdoor gardening activities also include activities for the other half of the class that build on the concepts taught in CHANGE classes. After the first group completes the gardening activity, the two groups change roles, ensuring that all students participate in both activities.

In the garden, breaking into mini-teams creates groups of a more manageable size, which help keep students engaged in experiential learning. Each of the mini groups in the garden should have an activity. These are called “sponge” activities and can include observing the garden with a magnifying glass and drawing what you see or counting how many different bugs you can find. While some of the mini groups are working on their sponge activity, one mini group is learning how to plant seeds. Demonstrate how to

properly plant a seed or transplant a seedling and then oversee each student while they perform the same tasks. Switch mini groups until all students have participated.

Additional Garden Ideas:

- Gardening recess: In order to spend more time in the garden with students, the educator can take students to the garden during recess where they can practice planting, gardening, and harvesting skills. If the garden is strategically placed in the recess area, the option to visit the garden at recess can become a part of their daily lives. If the garden is not in the recess area it is important to arrange with recess staff that children are going with you to the garden. Be aware that other children may wander away from the recess area and want to join you, but will forget to get permission to leave the recess area. Setting up parameters with students and staff is important.
- After School Gardening Club: Garden clubs provide children with an avid interest in the garden an opportunity to spend time in the garden beyond CHANGE classes. It is necessary to find a teacher who will organize and run the club. We suggest that the club meet once or twice a week.

Hand Washing:

Students are taught the importance of washing hands after gardening after activities, and the proper technique for washing hands after each indoor and outdoor gardening activity.

Appendix B

- How to Build a Light Rack
- How to Build a Raised Bed Garden Box

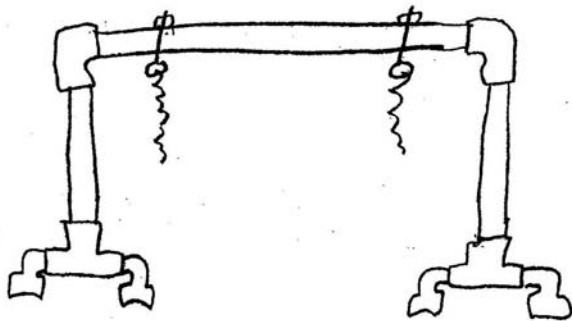
How to Build a Light Rack

Materials:

- (1) 1-1/4" lumen PVC Pipe-4'5" long
- (2) 1-1/4" lumen PVC Pipe-2' long
- (2) 1-1/4" lumen PVC Elbow SLxSL
- (2) 1-1/4" lumen PVC Tee SLxSLxSL
- (4) 1-1/4" lumen PVC ST90 Elbow SLxSL
- (4) S hooks
- (2) Eye Bolts 1/4" x 3"
- (2) 2' long pieces of chain
- (2) 1/4" Washers
- (2) 1/4" Nuts
- (1) 4' long fluorescent shop light with bulbs

Instructions:

- Drill holes in the **4'5" long PVC pipe** 6" from either end.
- Slip the **Eye Bolt** through with the eye facing downward and secure in place with **washer** and **nut**. Do this for both sides.
- Attach **PVC elbows** to both ends of 4'5" pipe.
- Attach **2' PVC pipe "legs"** into each end of the elbow.
- Insert **PVC tee** to bottom of each 2' leg.
- Attach the **PVC ST 90 elbows** to each end of each PVC tee.
- Hook the **S hooks** onto each Eye Bolt and attach **chains**.
- Assemble **4' long fluorescent shop light** (if necessary) and hook to the chains.



How to Build a Raised Bed Garden Box

Materials:

- **(24) 3" exterior wood screws**
- **(40) 2 1/2" exterior wood screws**
- **(8) 2x8 pieces of wood**
 - **(4) 10' long**
 - **(4) 4' long**
- **(4) 2x4 pieces of wood-16" long**
- **(6) 2x2 pieces of wood-16" long**
- **2 yards of soil**

*Cedar wood is recommended for longevity of the box

Instructions:

- You will begin by making two frames that will be stacked on top of each other to make a box that is 16 inches tall.
- Place one **4' 2x8 piece of wood** perpendicular to a **10' 2x8 piece of wood** and screw (using the **3" exterior wood screws**) from the outside of the 10' 2x8 piece of wood into the 4' 2x8 piece of wood creating the first corner.
- Attach the second **10' 2x8 piece of wood** staggering the corners by screwing from the outside of the 4' 2x8 piece of wood into the end of the 10' 2x8 piece of wood.
- Complete the rectangle by attaching the second **4' 2x8 piece of wood**, screwing from the outside of the 10' 2x8 piece of wood into the end of the 4' 2x8 piece of wood.
- For the last corner, screw from the outside of the 4' 2x8 piece of wood into the end of the 10' 2x8 piece of wood.
- Assemble the second frame on the ground next to the first frame, staggering the corners at opposite locations from those on the bottom layer to add more stability.
- Place the frames on top of each other.
- Secure the two frames together by placing the **16" 2x4 pieces of wood** on the inside of each corner of the box. Use the **2 1/2" exterior wood screws** to secure each layer of the box. Screw into the 2x4 pieces from the inside of the box going through the 2x8's.
- Place the **2x2 16" pieces of wood** on the inside of the box. There should be 2 pieces on each side of the frame. The pieces should lay flat on the frame, running perpendicular to the outside pieces of the frame. Place them 3 feet from either end.
- Secure the 2x2 pieces of wood using the 2 1/2" exterior wood screws. Drill one screw into the top frame and another into the bottom frame. This will

keep the frames from sliding apart. Always screw from the inside of the frame to the outside. This will avoid injury from the screws when the frame is filled with soil.

- Place completed garden box onto your desired garden location.
- Fill with soil.