Healthy Gardens, Healthy Youth
Educational Toolkit Framework

The Educational Toolkit was developed to provide 19-20 lessons over an 18-month period for interventions schools in Healthy Gardens, Healthy Youth, the People’s Garden School Garden Pilot Project Research Grant (USDA CN-CGP-11-0047). The lessons began in the early spring 2012, and extended through the next school year, ending in Spring 2013.

A team of extension specialists in nutrition, horticulture and youth development reviewed 17 (see references) curricula, numerous garden implementation resources and other materials to select appropriate resources for this project. Criteria used to select curricula for consideration included 1) experiential learning 2) age-appropriate nutrition, food, and gardening content and skills 3) research-based content and standards alignment, 4) Science, Technology, Engineering and Math (STEM) area focus, 5) support for the school garden.

Lessons were selected from ten curricula (detailed below) to meet the necessary topic areas for the two years. Permission from the original authors was sought for reproduction in the Educational Toolkit. Additional activities directly related to the garden were developed to enhance the lesson. Since each state has slightly different educational standards, a compendium of content standards and benchmarks compiled by Mid-continent Research for Education and Learning, a private nonprofit corporation was used as standards. During this grant period, the Common Core Standards were introduced and the USDA introduced MyPlate to replace MyPyramid. Some lessons may contain references to MyPyramid.

The Toolkit provided 10-11 lessons to be taught in 2012 between February and the end of the school year in weekly sessions, and nine lessons to be taught through the month from September 2012 – May/June 2013. Because classes in the Arkansas and Washington could begin gardening earlier in the year than Iowa and New York, it was suggested that they start in 2012 with the garden planning and planting lessons, and then cover the first few lessons later in the spring.

The Toolkit included information and safety guidelines to create, maintain and harvest gardens; store, use and sample garden produce; take the garden through the summer; build community capacity; and sustain and grow the program. In addition it provided tasting and snack suggestions and information on the use of produce in the school cafeterias.

All Toolkit resources were available on a password-protected website. Lessons were introduced through webinars posted to the secure website and videos on our YouTube channel https://www.youtube.com/user/ExtSchoolGarden. Other supplementary materials, such as donated books, were delivered to the schools by the local Extension Educator.
Lesson Sequence

Spring 2012, February – May/June (depended on school end dates)

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<td>Rock to Ice Cream: Keep Soil Alive</td>
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<td>Our Food Garden Plan</td>
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<td>Seasons through the Year</td>
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<td>Planting the Garden &amp; Nutrition Super Hero</td>
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<td>Seeds and Sprouts</td>
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<td>Salad Gardens</td>
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<td>Life in the Garden</td>
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<td>10</td>
<td>Garden Patrol</td>
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<td>11</td>
<td>Salad Party</td>
<td>Eating from the Garden</td>
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Fall 2012 – Spring 2013

For Grade 2 students who went into Grade 3

<table>
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<th>Lesson</th>
<th>Grade 3</th>
<th>Grade 5/6</th>
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<tr>
<td>September</td>
<td>Harvest</td>
<td>Harvest</td>
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<tr>
<td>October</td>
<td>Post-Harvest, Garden Clean-up</td>
<td>Post-Harvest, Garden Clean-up</td>
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<td>November</td>
<td>Apples and Squash</td>
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<td>December</td>
<td>MyPlate</td>
<td>Making Healthy Food Choices</td>
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<tr>
<td>January</td>
<td>My Food Garden Plan</td>
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<td>February</td>
<td>Winter Vegetables and Mulch</td>
<td>Winter Vegetables and Mulch</td>
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<td>March</td>
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<td>Planting Our Garden</td>
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<td>April</td>
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<td>Food for Plants and People</td>
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<tr>
<td><strong>Lesson 2 October:</strong> Post-Harvest: What do you do with the garden after the harvest? “Put Your Garden To Bed,” University of Maryland; “Improve Your Soil with Cover Crops,” Cornell University; “Composting” from <em>Garden Mosaics</em>, American Community Gardening Association and Cornell Garden-based Learning; “Questions About Composting,” Iowa State University Extension; “Tool Safety Game,” <em>Growing in the Garden: Local Foods and Healthy Living</em>, Iowa State University Extension and Outreach</td>
<td>Learn steps to put the garden “to bed” at the end of the season. Define composting. Describe what compost organisms need to grow and multiply. Explain how to build and care for a compost pile. Describe cover crop use. Review tool safety.</td>
<td>Tool safety, garden clean-up, compost science</td>
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<tr>
<td><strong>Lesson 3 November:</strong> Exploring Root Vegetables: Source: “Root Vegetables” Network for a Healthy California <em>Harvest of the Month</em></td>
<td>Compare and contrast the content of predominant nutrients – including vitamins and minerals – in different root vegetable varieties (e.g., jicama, parsnips, ...</td>
<td>Taste testing root vegetables, examine nutrient labels, compare and contrast nutrients, discuss the six subgroups of root vegetables and their</td>
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<tr>
<td>Grade 5-6</td>
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|          | rutabagas, turnips, yams, sweet potatoes, potatoes). Describe the parts of  | parts and growing needs.  
    tuber plant, explain root crop growing needs.  
    Pear tasting; Jicama Cucumber Salad       |                                  |
|          |                                                                                           |                              |
| Lesson 4 December: Making Healthy Food Choices  
Source: “Eating from the Garden” University of Missouri Extension | Identify the amount of food from each food group needed each day; recognize how much food they are eating. | Food group matching; vegetable tasting (beets); portion size activity  
    MyPlate Roll-up tasting (recipe called MyPyramid Roll-Up) |
| Lesson 5 January: How do you plan a garden?  
Source: “Our Healthy Garden Plan” from Growing in the Garden: Local Foods and Healthy Living, Iowa State University Extension and Outreach | Identify and select locally grown fruits and vegetables to plant, grow, harvest, and eat.  
    Use a variety of mathematical and science concepts and skills to create local garden plans and calendars. | Identify plants that will grow in the climate, space and timeframes; do seed catcher activity; create a garden plan and garden calendar.  
    Lettuce Wraps |
| Lesson 6 February: Mulching for Water Conservation  
Source: “Mulching for Water Conservation” from Kids Cook Farm Fresh Foods, California State Department of Education; Exploring Cabbage, from: Harvest of the Month: Cabbage, Network for a Healthy California | Describe the role of mulch in conserving water.  
    Identify benefits, types and uses of mulch.  
    Conduct experiment to compare water evaporation with and without mulch.  
    Identify cruciferous vegetables and associated nutrients especially phytochemicals. | Evaporation experiment; student sleuth activity; cabbage taste test and graphing exercise; make a plan; acid-base activity  
    Book options: Green Power: Leaf and Flower Vegetables by Meredith Sayles, 100 Vegetables and Where They Came From by William Woys Weaver, A Seed Is Sleepy by Dianna Hutts Aston |
<p>|          | Students learn Chinese jump rope.                                                            |                               |</p>
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<td><strong>Lesson 7: March: How Do You Plant a Garden?</strong>&lt;br&gt;Source: “Planting Our Healthy Garden,” from Growing in the Garden: Local Foods and Healthy Living Iowa State University Extension and Outreach</td>
<td>Plant a garden using “Our Healthy Garden Plan” from Lesson 5 and the most appropriate planting methods according to the type of garden and the plants selected.</td>
<td>Transplanting, seeding, choosing tools, garden and tool safety, garden planting matching game</td>
<td>Students plant the garden.</td>
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<td><strong>April:</strong>&lt;br&gt;Plants, Animals and Food&lt;br&gt;“Photosynthesis” from Growing in The Garden, Iowa State University Extension and Outreach; “Caring for the Garden” Year from Got Dirt? Wisconsin Department of Public Health; “Action Project,” from Garden Mosaics, Cornell University Cooperative Extension Service</td>
<td>Review photosynthesis to identify and describe process and reasons why it is important to plants and animal. Garden culmination project for students to do background research, create and complete a project.</td>
<td>Photosynthesis experiment, diagram; weeding and watering the garden; culminating project&lt;br&gt;Green Smoothie tasting&lt;br&gt;Garden Journal</td>
<td>Students work in the garden and do a skit.</td>
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<td><strong>May:</strong>&lt;br&gt;Let’s Celebrate Our Garden Harvest!&lt;br&gt;“How do you harvest garden produce?” Growing in The Garden: Local Foods And Healthy Living, Iowa State University Extension and Outreach; “Garden Celebration” from Eating From The Garden, University of Missouri Extension</td>
<td>Apply harvesting, cleaning, and salad mixing strategies for salad crops.&lt;br&gt;Plan and implement a Salad Party.&lt;br&gt;Review the nutrition and gardening concepts.</td>
<td>Eating from the Garden Jeopardy&lt;br&gt;Garden harvest tasting</td>
<td>Students harvest in the garden.</td>
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Lesson One: Harvesting Your Edible Garden
For September or beginning of school year

It’s time to harvest summer crops. How do you know when crops are at their peak for flavor and texture? What is the best way to harvest them and keep their flavor? “Harvesting Your Edible Garden” is based on lessons from GROWING IN THE GARDEN, LOCAL FOODS AND HEALTHY LIVING, Iowa State University Extension and Outreach. Students have a chance to harvest vegetables grown over the summer, calculate crop yield and market value.

Content objectives: Describe how most foods start in the soil and then go through several steps before we eat it; Understand the implications of how little soil is left to grow food for a growing population; Identify ways to have access to healthy foods; Understand characteristics of carrots and conduct an experiment.

Life Skill objectives: Healthy living, Critical thinking, Communication, Citizenship, Leadership, Decision making, Problem solving, Cooperation

Core and STEM concepts and skills:
Science Science as inquiry, Earth and space, Life science
Math Operations and algebraic thinking, Geometry, Measurement, Data
Language Arts Speaking, Listening, Writing, Viewing
Social Studies Behavioral sciences, Economics,

Healthy snack: Skinny Greens, Harvest Soup, Veggie-fetti, Summer Garden Salsa, Veggie Vehicles

Additional and supporting resources:
More recipes can be found at https://extension.tennessee.edu/publications/Documents/W362-E.pdf

Documenting the results of school gardens can be done in a variety of ways. Here is one example:
https://extension.umd.edu/sites/default/files/_docs/OurHealthyHarvest.pdf
LESSON PLANS FOR 2012-13 SCHOOL YEAR, GRADE 5 or 6

August/September: Harvest

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NOTES: The bolded items in the following lists can be found in the www.peoplesgarden.wsu.edu Educational Toolkit, Grade 3, August/September: Harvest. The Core standards for this lesson are identified in the Educational Toolkit, Alignment chart found in the Introduction. Master gardeners, local vegetable growers, garden and nutrition experts – including students’ family members, and other classroom partners and volunteers are good resources to help to deliver this harvest lesson.
BEFORE THE LESSON
Do you have garden produce to harvest? If so, great! All of the following items will help you harvest, clean, store and prepare the garden produce according to university experts.

If your garden has been sleeping through the summer, we recommend that you take a field trip or bring in garden produce from a local farmer’s market, produce stand, or grocery store. Do item 1, skip 2 and 3, and continue through the rest of the items starting with item 4.

1. Grade 5 or 6, August/September: Harvest
This document contains all the curriculum items and resources you need for this lesson. All lesson downloads are located on the www.peoplesgarden.wsu.edu Educational Toolkit.

Harvesting and Storing Vegetables, Iowa State University Extension and Outreach
Food Safety Tips for School Gardens (page 3), United States Department of Agriculture
Please read and use these resources as guides to tell you when and how to harvest the crops from your school garden. If the students and their families have a garden or would like to start a garden, you may copy these resources to send home with the students.

3. Student Garden Journals
Garden Journals provide students the opportunity to reflect and record events in the garden.

4. Harvest Sampling Ideas and Recipes
Select a recipe based on what you have harvested in the garden or brought in from a local farmer’s market, produce stand, or grocery store. Be sure to have the students help to wash the garden produce and prepare it. You may want to host a Harvest Party and invite parents and garden helpers to taste some of the crops from your garden.

THE LESSONS
1. Harvesting Your Edible Garden is a lesson that you design based on the steps provided and what you are harvesting. If there are no crops to harvest, the lesson steps tell you to use garden produce that has been purchased or contributed to the project from a local farmer’s market, produce stand, or grocery store.

2. Harvest Sampling Ideas and Recipes provides more lesson components to incorporate into your lesson plans as well as and a guide to taste testing ideas and recipes that apply to fall crops. You can choose the ideas or recipes that best suit your situation.

AFTER THE LESSON
You may want to host a “Harvest Party” and invite other classrooms, foodservice staff, families, organizations, etc. to see the gardens and taste a bit of the results. This is a good way to grow support for your program.
SCHOOL GARDEN HARVESTING GUIDE
Prepared by Liz Falk, Cornell Garden-based Learning

Harvesting is one of the nicest chores of the season. If you follow a few important, but easy tips, you will get the most of your crops. Some crops (e.g. carrots) only provide one harvest, while other crops (e.g. lettuce) can provide multiple harvests. If possible, harvest early in the morning, after the dew dries, but before the heat of the day.

LEAFY GREENS – Lettuce & the Brassica Family
(including Spinach, Kale, Chard, Collards, Asian Greens, Mustards)
To harvest at peak flavor and freshness, harvest young greens when they are just a few inches long. At this stage all greens are tender and delicious eaten raw in a salad. These are called “baby greens”. Pick the largest, outside, leaves first while leaving the smaller and younger inside leaves for harvesting in a week or two. If possible, eat your greens the same day you pick them. Larger leaves, 6-12” long, are less tender and are best for cooking. Remember that greens cook down; plan about 6 cups of greens for 4 usual servings. Always wash garden greens carefully before eating or cooking to remove dirt and small insects.

Tip: Snip (with scissors or skilled fingers) the greens about ½-1” above the base of the plant to encourage new growth. Harvesting this way will allow you to get 3-5 cuttings of lettuce and spinach and even more from kale, chard and other hardier greens.

Note on Lettuce: If you planted head lettuce and prefer to harvest an entire head, wait until the entire lettuce plant is about softball - melon size and looks like the shape of head lettuce, as you know it. Don’t wait too long though. Harvesting this way will allow you to get 3-5 cuttings of lettuce and spinach and even more from kale, chard and other hardier greens.

Simple Greens Recipe
- Wash and dry greens and cut larger leaves into pieces about 3 inches long.
- Heat a bit of olive oil in pan with a clove of chopped garlic or a few tablespoons of chopped onion. Cook 2-3 minutes.
- Add greens and a dash of water. You may keep the greens plain or drizzle with a dash of soy sauce or balsamic vinegar.
  Cook 3-4 minutes until softened.
- Remove from heat, place into bowl. Sprinkle with slivered almonds, sunflowers seeds and dried cranberries, or chives chopped chives from your garden.
  Serve cold or warm.

LEGUMES – Peas, Snow Peas, Beans
Harvest peas with 2 hands, holding the vine with one hand while snipping the entire pod off the vine with your other hand. Harvest when fully mature, about 2” long for peas and 4” long for beans, depending on the variety planted. Harvesting encourages new growth, so be sure to pick off over-ripe pods you may have missed earlier on. Continue to harvest from the same vines as the legume ripens.
Peas and young beans can be eaten raw, added to salads, or lightly steamed or sautéed.

**Cucumbers & Squash (Cucurbit Family)**
Harvest cucumbers as they ripen to the desired size. For pickling, fruits should be 4 to 5 inches long, for eating fresh; most varieties grow to 7-8 inches long. Cucumbers will develop a bitter taste if they are allowed to over-ripen. (Note: Some varieties such as European or Dutch cucumbers can grow much longer. This is another reason why clear labeling of the plants in the ground is useful.)

To ensure cucumber vines continue to produce heavily all season long, it’s best to harvest daily to prevent them from becoming overgrown.

Enjoy cucumbers raw, in a salad or try making some pickles! For easy and safe refrigerator pickle recipes, contact your local Cooperative Extension office.

Even though huge zucchini squash are impressive, they will be more flavorful if they are picked when they are smaller.

**Tip:** Use a sharp knife or pair of scissors when harvesting, and leave a short length of stem on each fruit.

**Roots—Carrot, Beets, Radish, Potato**
It can be difficult to determine if root crops are full grown and ready to harvest because they grow underneath the soil. You may recall, most seed packets will tell you how many “Days to Harvest”. This is the number of days it takes from planting to harvesting. If you can keep track of when you planted the seeds (maybe you wrote it down in the garden journal or it’s listed on the label that next to the plant in the ground), you’ll know about when they are ready. That said visual clues are always helpful. Roots start to lift themselves up out of the ground a bit as they develop. You’ll see radishes, beets and carrots creep a bit (< 1/4 inch) above the soil giving you a clue about how wide they are getting.

**Did you know?**
Beet greens are edible and incredibly nutritious. You can harvest a few from each plant when small and add them to salads, or wait until you harvest the root and cook them up like you do kale, chard or other greens.

**Tip:** Radishes and beets are easy to pull out of the ground whole. Carrots often break off, leaving half of that sweet orange snack for the worms. To harvest them whole, use a digging fork to loosen the soil around the root and pull it out at the base of the greens. For radishes and beets, grab the plant right at the base of the stem, loosen the root a bit by rocking it back and forth, and then pull. If the whole thing does not come up, gently use a digging fork as you would for carrots.

For potatoes, you can start gently digging for new potatoes once the plants start to bloom. Wash and cook new potatoes immediately, as they do not store well at all. If you are planning to harvest potatoes to store for a while, wait until the tops of the plants start to yellow and die back. Then gently dig around the perimeter of the plant and dig up the tubers. If you are
planning on storing them, don't wash them! Let them sit out in a cool place for a few days to cure, then gently rub off any dirt, and store in a cool, dark place.

**FRUITS – Strawberries, Tomatoes, Peppers, Eggplant**
Similar to cucurbits, fruits like to be harvested when ripe and harvesting regularly encourages new production. Use a scissors or be very careful to snip eggplant and peppers from the stem without damaging the fruit. Leaving a small stem on the harvested fruit will help keep it ripe and ensure you don’t bruise it when harvested. Carefully pick tomatoes from the plant. For strawberries, grasp the stem just above the berry between the forefinger and the thumbnail and pull with a slight twisting motion. Carefully place the fruit into your containers.

**HERBS – Basil, parsley, mint, cilantro, oregano, rosemary, tarragon, sage, chives, lavender, thyme & more.**
Herbs are grown for their leaves, flower, roots or seed. Most commonly, culinary herbs are grown for their leaves and should be harvested before they flower. Flowering can cause the foliage to develop a bitter flavor. For example, while chives are quite attractive in bloom – and their flowers are edible and delicious – the stems tend to become tough and woody after bloom. Some general guidelines for harvesting herbs:

- Begin harvesting the herb when the plant has steadily been producing new growth. Harvesting generates the plant to continue to produce. Just be sure to leave enough leaves so the plant can continue to photosynthesize. Don’t be afraid to harvest. Up to 75% of the current season's growth can be harvested at one time!
- Harvest herbs before flowering, otherwise, leaf production declines because the plant will put its energy towards flowering and producing seed to reproduce. *Tip:* Pick off flowers buds as you notice them develop.
- ‘Annual’ herbs (basil, cilantro, chives) will have to be planted each year. They have soft stems and can be harvested until frost. Perennial herbs (rosemary, lavender) have somewhat woody stems and can be clipped until about one month before the frost date.
“Healthy Gardens, Healthy Youth”
People’s Garden School Pilot Project

The Extension Partnership including:
Washington State University Extension
Cornell University Cooperative Extension
Iowa State University Extension and Outreach
University of Arkansas Extension

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# Harvesting and Storing Vegetables

(Adapted from ISU Extension Publication, PM 731 Harvesting and Storing Vegetables)

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<th>Approx. Storage Period</th>
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<tr>
<td><strong>Snap Beans (bush or pole)</strong></td>
<td>Harvest the pods when they are almost full-sized but before the seeds begin to bulge. Hand pick with small stem attached to the pod. Do not break pod.</td>
<td>Cool Refrigerate: 40 - 45°</td>
<td>7 – 10 days</td>
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<tr>
<td><strong>Beets</strong></td>
<td>Pull or dig beets when roots are 1 to 1½ inches in diameter. Cut tops to ½ inch above root.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>4 months</td>
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<tr>
<td><strong>Broccoli</strong></td>
<td>Cut when flower heads are blue-green and about 6 to 7 inches across but before small yellow flower buds start to open. The stems below the flower head and small leaves are also very nutritious.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>10 – 14 days</td>
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<tr>
<td><strong>Cabbage</strong></td>
<td>Cut when heads become large and solid. Don’t delay because heads are prone to cracking when they get large.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>1 to 2 months</td>
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<tr>
<td><strong>Cantaloupe (Muskmelon)</strong></td>
<td>The skin between the netting turns from green to orangish-yellow. The fruit will separate easily from the stem.</td>
<td>Cool Refrigerate: 40 - 45°</td>
<td>1 to 2 weeks</td>
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<td><strong>Carrots</strong></td>
<td>Dig when roots are ¼ inch or more across. Be careful so that you don’t break the roots when digging. Remove tops to ½ inch above the root.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>3 or more months</td>
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<tr>
<td>CROP HARVEST GUIDE</td>
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<td>CUCUMBERS</td>
<td>Check plants often once they start bearing. Keep fruit harvested for continuous production.</td>
<td>Moderate Refrigerate: 45 - 55°</td>
<td>1 to 2 weeks</td>
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<tr>
<td>EGGPLANT</td>
<td>Check plants often once they start bearing. Keep fruit harvested for continuous production.</td>
<td>Moderate Refrigerate: 45 - 55°</td>
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<tr>
<td>GARLIC</td>
<td>One time harvest. Clean garden area after harvest.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>Up to 6 months</td>
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<tr>
<td>KOHLRABI</td>
<td>One time harvest. Clean garden area after harvest.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>Up to 2 months</td>
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<td>LETTUCE</td>
<td>Cut and it will come back for one or two more harvests, then remove spent plants.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>1 to 2 weeks</td>
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<tr>
<td>ONIONS (green)</td>
<td>One time harvest. Clean garden area after harvest.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>2 to 3 weeks</td>
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</tbody>
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*Grading information continued.*

- **Grade 5 Lesson 1 September**
### GENERAL INFORMATION

**Harvesting and Storing Vegetables. Continued**

(Adapted from ISU Extension Publication, PM 731 Harvesting and Storing Vegetables)

<table>
<thead>
<tr>
<th>CROP HARVEST GUIDE</th>
<th>HARVEST TIMES</th>
<th>OPTIMUM STORAGE CONDITIONS, °F</th>
<th>APPROX. STORAGE PERIOD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Onions (dry)</strong></td>
<td>One time harvest. Clean garden area after harvest.</td>
<td>Cold (after curing) Refrigerate: 32 - 40°</td>
<td>3 months (use before they sprout)</td>
</tr>
<tr>
<td><strong>Peas</strong></td>
<td>Check plants often once they start producing seed pods. Keep pods harvested for extended production.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>1 to 2 weeks</td>
</tr>
<tr>
<td><strong>Peppers</strong></td>
<td>Check plants often once they start bearing. Keep fruit harvested for continuous production.</td>
<td>Moderate Refrigerate: 45 - 55°</td>
<td>2 to 3 weeks</td>
</tr>
<tr>
<td><strong>Potatoes</strong></td>
<td>One time harvest. Cure potatoes in a cool shady location for two weeks. Clean garden area after harvest.</td>
<td>Cool Refrigerate: 40 - 45°</td>
<td>New potatoes only store for a few weeks. Large, cured potatoes can be stored in a dark location for 3 or more months</td>
</tr>
<tr>
<td><strong>Radishes</strong></td>
<td>One time harvest. Clean garden area after harvest.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>3 weeks</td>
</tr>
</tbody>
</table>

#### Onions (Dry)

Harvest when the tops fall over and begin to dry. Pull with tops on and dry them in a protected place for 3 to 4 days. Cut tops to 1 inch above the bulb and store in shady area in mesh bags or single layers for further curing until stems tighten up and outer scales are dry.

#### Peas

Pick peas with edible pods such as snow peas when pods are just filled, but before the seeds become hard and starchy. Store peas in the pod. Harvest snap peas when the pods are beginning to plump and while the pods are still glossy and smooth.

#### Peppers

Harvest when the pepper is large, firm, and crisp. Fully ripe peppers are slightly sweeter and may be red, orange, yellow or other colors.

#### Potatoes

New (small) potatoes can be dug in early summer when the vines are lush and green. Large potatoes are dug as soon as the plants die. Be careful not to cut the potatoes when digging by placing the fork at least 8 inches from the stem of the plant.

#### Radishes

Pull when the roots are 1 to 1½ inches in diameter, remove tops about ½ inch above the root.
### GENERAL INFORMATION

<table>
<thead>
<tr>
<th>CROP HARVEST GUIDE</th>
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<th>OPTIMUM STORAGE CONDITIONS, °F</th>
<th>APPROX. STORAGE PERIOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPINACH</td>
<td>Cut and it will come back for one or two more harvests, then remove spent plants</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>1 to 2 weeks</td>
</tr>
<tr>
<td>Harvest when leaves are 2 to 6 inches long. Cut about 1½ inches above the ground for re-growth to occur.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUMMER SQUASH (Zucchini)</td>
<td>Check plants often once they start bearing. Keep fruit harvested for continuous production.</td>
<td>Cool Refrigerate: 40 - 45°</td>
<td>1 to 2 weeks</td>
</tr>
<tr>
<td>Cut squash from plant when they are 6 to 12 inches long. The rind is very tender and scrapes easily. Scallop type (‘Patty Pan’) are harvested when 3 to 5 inches in diameter. Leave ½ inch stem on the fruit.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWEET CORN</td>
<td>Check frequently when they reach maturity. Harvest all at once or within a few days.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>1 week</td>
</tr>
<tr>
<td>Harvest by grasping the ear at its base and then twisting downward. It is ready as soon as the silks are brown and dry at the ear tip.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWEET POTATOES</td>
<td>Harvest all at once. Cure for 1 week in a warm, shady location.</td>
<td>Moderate Refrigerate: 45 - 55°</td>
<td>3 or more months</td>
</tr>
<tr>
<td>Harvest in late fall, just before frost, by digging with a garden fork. Be careful not to stab a tuberous root.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOMATOES</td>
<td>Check plants often once they start bearing.</td>
<td>Cool room 55 - 65°</td>
<td>4 to 7 days</td>
</tr>
<tr>
<td>Pick any time from pink to fully red stage. Pick and remove stem from the fruit.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WATERMELON</td>
<td>Check plants often once they start bearing.</td>
<td>Moderate to cool room 45 - 65°</td>
<td>2 to 3 weeks</td>
</tr>
<tr>
<td>Harvest when fruits are full sized, rind is dull in appearance, and the bottom part touching the ground turns from greenish white to creamy yellow. Leave 2-inch long stem attached to fruit.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Food Safety Tips for School Gardens

Growing and Harvesting Produce
A school garden provides an opportunity for children and volunteers to learn about how to handle food safely. The following are some food safety tips to follow when growing and harvesting produce.

- Ensure that all persons, including staff, students, and volunteers receive basic food and gardening safety training instructions according to local health regulations. The following topics are recommended:
  - Handwashing and personal hygiene
  - Cleaning and sanitizing garden equipment and containers used to hold produce
  - Handling produce during harvest, washing, and transportation
  - Glove use
- Ensure that volunteers are covered by the school district insurance policy in the event of accident or injury.
- Require signed permission slips for all student gardeners. Permission slips should list potential hazards of working in a school garden and identify any allergies the child may have.
- Do not allow anyone to work in the garden while sick, or until 24 hours after symptoms, such as vomiting or diarrhea, have subsided.
- Ensure that all harvesters wash hands thoroughly in warm, soapy water for at least 10 to 15 seconds, and then rinse with potable water. Ensure that all open cuts or wounds on hands, arms, or legs are properly covered prior to participating in the harvest.
- Require harvesters to wear closed-toed shoes to prevent cuts, stings, or other injuries.
- Consider using single-use disposable gloves when harvesting, or handling, fresh produce as an extra precaution.
- Harvest the garden regularly and remove any rotten produce.
Food Safety Tips for School Gardens, continued

• Use cleaned and sanitized food grade containers, such as plastic bins or buckets, to hold harvested produce. Do not use garbage bags, garbage cans, and any container that originally held chemicals. These types of containers are made from materials that are not intended for food use.
• Clean harvesting tools, such as knives, scissors, etc., with soap and potable water immediately before and after each gardening session.

Using School Garden Produce in your School Meal Program
• Check with your local health department to ensure that local regulations permit food from gardens to be served as part of school meals.
• If the harvest from the school garden will be used in the school meals program, the school garden coordinator should work cooperatively with the school nutrition director to plan and implement the garden.
• Discuss food safety practices in the garden with school garden coordinators. Consider asking gardeners to document their practices. Use the information in this document as a guide to identify appropriate practices.
• Accept produce harvested from school gardens only when school nutrition staff is present to receive it. All produce dropped off or left when staff is not present should not be used in the school meal programs.
• See Best Practices: Handling Fresh Produce in Schools for guidelines on receiving, storage, preparation, and service of fresh produce in schools.
• Reject produce that does not meet school nutrition program standards.
• Receive and inspect produce harvested from school gardens according to the same procedures used to inspect produce from the district’s distributors.
• Do not use any produce that has been noticeably contaminated by animals or insects.
• Refrigerate garden produce immediately, unless the particular item is normally held at room temperature.
• Store, prepare, and serve school garden produce separately from other sources of produce to maintain traceability.
• Document service of school garden produce on the menu management/food production record. See Ensuring Traceability of Fresh Produce for more information.
• Ensure that liability for a potential foodborne illness caused by produce grown in school gardens is covered by your school district.
Harvest Sampling Ideas and Recipes

Teacher’s Notes: When you are finished harvesting the garden, you can calculate the value of the garden harvest. Take a list of your crops to the farmer’s market or the grocery store and write down the cost per pound or amount of the same fresh vegetables or fruits that you harvested in your garden.

The activities in this section are flexible depending on the harvesting that needs to be done and the food sampling ideas and recipes you choose to do. You may have other sampling ideas or recipes you would like to do. Maybe you want to invite parents and others to your harvest celebration and serve some of your garden goodies. You can use these ideas and recipes throughout your garden and nutrition program.

Another task you will need to do after harvest is to work with the students to put your garden to bed. The information in Unit 8, What do you do after the harvest?, General Information and advice from Master Gardeners or experienced gardeners will help you to do that. For now, celebrate the harvest!

Harvesting

Use the following guidelines to gather the supplies and harvest your garden:

- Harvesting and Storing Vegetables chart
- Rulers or dibbles to measure crops
- Student Garden Record and pencils or markers from the Do section
- Paper bags or containers for harvested garden produce and pencils or markers
- Scale and pint and quart size containers to weigh and measure harvested garden produce
- Harvest Rules sign

Apply

Expand

Elaborate in a new way

20 to 40 minutes or longer depending on the harvest and what you choose to eat, possibly on another day or a few days
POTENTIAL VALUE OF YOUR GARDEN CROPS

If we sold the crops we harvested in our garden, how much money do you think we would make?
Write the name of each of the crops you harvested in a place where everyone can see it and record a few guesses or take an average of all the guesses and write it down after each crop.

Create a chart similar to the one below and display it where everyone can read and work with it.

<table>
<thead>
<tr>
<th>CROP</th>
<th>YIELD</th>
<th>MARKET VALUE</th>
<th>GROSS PROFIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples: tomatoes</td>
<td>12 pounds</td>
<td>$2.50/lb</td>
<td>$30.00</td>
</tr>
<tr>
<td>cucumbers</td>
<td>22 cucumbers</td>
<td>.75 each</td>
<td>$16.50</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>$46.50</td>
</tr>
</tbody>
</table>

Refer to the examples in the chart and help the students to complete it. Hopefully you have read the Teacher’s Notes at the beginning of this section and are prepared for the market values or each crop.

Crop column: Have the students work together to name and list all the crops they planted.
Yield column: Have the students add up the total yield for each crop from their individual or the group’s Garden Records and record the totals.
Market value: Write down the farmer’s market or grocery store costs per pound or amount.
Gross profit: Have the students multiply the yield times the market value and record the amount for each crop.
TOTAL: Add the figures in the last column and record the gross profit of your entire garden harvest at the bottom.

 Explain that the gross profit does not take into account the amount of money it took to buy the seeds, transplants, and any garden supplies and equipment.

How do you feel about the value of our garden crops?
Talk about surprises, possible things you harvested and forgot to record,
If we took our crops to a local farmer’s market and sold them, which crops would have made the least and most amount of money?
Use the chart to determine the answers.

How can you use this chart and our Garden Records to plan for next year’s garden?
Garden records help gardeners determine what and how much they want to plant the next year. Discuss yields, crop failures, challenges to growing the crop, what you want to do with next year’s crops, if you will have more or less space, if you want to try something new, etc. Write notes and save them until you plan the next garden.

SAMPLING IDEAS AND RECIPES FOR A HARVEST CELEBRATION

Select the sampling ideas and recipes that best suit your situation. This is a great time to host a harvest celebration and invite families and others to enjoy these recipes with you. Share your experiences with your garden, including the findings from your Garden Record and the math activities. Tell your guests about any future plans and how they might get involved.
Continue to use the Harvest Rules to prepare food. The students should help to wash and prepare the food. They can use plastic knives and plastic plates.

1. **Garden Fresh!**
   Sample the garden produce in its raw form as soon after it has been picked and washed as possible. That is when it is at its peak of flavor and texture. The students can wash it, if necessary – cut or slice it using plastic knives and plates, and taste it.

2. **Revealing Taste Tests**
   *In his book, All New Square Foot Gardening Cookbook, Mel Bartholomew (the founder of the square foot gardening method) offers these great taste comparison tests for kids.*

   **Taste Test for Green Beans and Snow Peas**
   - Have the students rinse off and eat one of the green beans or snow peas right after they picked it in the garden. Ask the students to describe the taste and texture.
   - Have them put a green bean or snow pea on their clean desk or counter and in an hour, wash it and eat it. Ask the students to describe the taste and texture and compare it to the one they ate right after they picked it.
   - Put enough green beans or peas in the refrigerator for a day or two before having the students wash and eat them. Ask the students to describe the taste and texture and compare it to the other two they ate.
   - Discuss which one tasted the best and possible reasons why. Fruits and vegetables start deteriorating right after they are picked. They may loose some of their flavoring and texture. You will also get a variation of flavor and texture depending on the degree of maturity of each green bean or snow pea. Most vegetables taste the sweetest and have their best texture when they are at just the right stage between unripe and too ripe.
   - Encourage the students to do this taste test with their families.

   **Taste Test for Broccoli, Cauliflower and Other Crispy Vegetables**
   Do a blind taste test with the students tasting a fresh bite of a crispy vegetable straight from their garden and another bite from the same vegetable bought at the grocery store. Ask the students which bite is crisper and tastes more like the “outdoors”, and which would they rather eat? After the discussion, reveal which vegetable was from the garden and which one was from the store.

   **Taste Test for Different Varieties of the Same Vegetable**
   Do a taste test with different types of lettuce, peppers, tomatoes, and so on to see which one you like the best. Record the information for reference when you plan your next garden.

3. **Skinny Greens**
   You can eat as many salad greens as you want without threatening your waistline or your weight. It is the choice of toppings and salad dressings that could make one bowl of green salad exceed 30 calories. No fears, the two salad dressing recipes below contain ingredients that come from gardens (and bees that help the garden produce food) and they are really low in calories.

   Cut the lettuces, spinach and other leafy greens from the garden and wash them in a strainer under running water. Drain the leaves. Tear them into smaller pieces, if necessary. Put them in a bowl with a lid. Add other garden vegetables such as slices or...
chopped pieces of radishes, green onions, zucchini, broccoli, carrots, or cauliflower. Put the lid on and shake lightly to toss the ingredients. Take off the lid and add sliced tomatoes or cucumbers as desired. Top with a dressing of your choice or the students can make one of the following recipes.

Balsamic Vinaigrette

In a clean quart-sized jar with a lid, add the following ingredients:

- 1/2 cup fresh basil leaves
- 1/3 cup balsamic vinegar
- 1/3 cup finely chopped shallots (green onions)
- 1/4 cup water
- 2 tablespoons honey
- 1 tablespoon olive oil
- 1/4 teaspoon black pepper

Put the lid on the jar and shake the dressing until all ingredients are blended.

From myrecipes.com and Cooking Light

Low-Calorie French

In a clean quart-sized jar with a lid, add the following ingredients:

- 1/2 cup tomato juice
- 2 tablespoons lemon juice
- 1 tablespoon finely chopped onion
- 1 tablespoon finely chopped green bell pepper
- 1/4 teaspoon salt
- 1/8 teaspoon pepper

Put the lid on the jar and shake the dressing until all ingredients are blended.

From CDKitchen.com

4. Harvest Soup

Harvest Soup can connect your garden harvest to the story Stone Soup by Marcia Brown. Everybody works together to make soup that is “fit for a king”. So, why not invite parents or other people to try this soup and celebrate the harvest!

Harvest Soup

Makes enough for 20 to 30 people

Supplies:

Stone Soup by Marcia Brown
2 medium-sized clean and sanitized hard rocks
2 camp stoves, stove burners, or electric skillets (3 quart) AND 2 3-quart pots
Measuring cups AND Measuring spoons
Knives (could be plastic) AND cutting boards OR Mechanical choppers
Several bowls (for raw ingredients after it is chopped)
Large stirring spoon AND Ladle
Soup bowls or hot beverage cups AND spoons
Paper towels AND Cleaning supplies
Washing stations for hands AND for washing vegetables and fruits
Ingredients:
Soup stock: 8 cups water
6 chicken, beef or vegetable bouillon cubes
Vegetables from your garden or that are or can be locally grown
Suggested options:
1 large onion
3 medium carrots
3 medium tomatoes
1 medium green pepper
2 ears corn
1 medium zucchini
1 large potato
12 green beans
2 handfuls peas, shelled
1 head broccoli
4 or less small head cabbage
3 okra
Herbs from your garden or that are or can be locally grown
Choose two or three plus salt and pepper:
½ cup parsley
2 teaspoons oregano
1 tablespoon basil
2 teaspoons rosemary
2 teaspoons marjoram
1 bay leaf
2 teaspoons thyme
Pasta option: 1 heaping cup small macaroni or shell noodles

Directions:
1. Before harvesting the garden, have the students take turns reading aloud and showing the pictures in the book *Stone Soup* by Marcia Brown.
2. Have the students role play the parts of the soldiers from the book by washing their hands and setting up the pots on the burners. Have them take turns adding 4 cups of water and 1 clean hard rock to each pot. Turn the burners on. Assign three students per pot to check back to see when the water starts to boil and add 3 bouillon cubes to each pot.
3. Have the students role play the parts of the villagers from the book by harvesting the garden crops, washing the crops and their hands, and carefully cutting the vegetables into smaller bite-size pieces for the soup. Demonstrate how the knife blade always goes down and away from you and toward the cutting board and how to keep fingers away from the part you are cutting. You can use plastic knives or appropriate food choppers. Tear or crush the herbs into tiny pieces. You may have to bring in additional locally grown vegetables to add to the soup.
4. Put hard, crispy vegetables in first, stir, and cook (simmer) for 10 minutes.
5. Add softer vegetables, herbs, and pasta, stir, and cook (simmer) another 10 minutes.
6. Ladle into small bowls or hot beverage cups, add a spoon, serve, and eat.

*ENJOY!*
5. **Veggie-fetti**

This salad is colorful and healthy confetti from the garden. The ingredients are flexible - use the fresh produce you harvested in your garden or got from a local farmer’s market, garden produce stand, or grocery store. This will serve six or thirty-six people depending on the size of servings and the amount of produce added to the salad. Have fun, practice food safety, be creative and enjoy every last bite.

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**Veggie-fetti**

2 to 4 medium zucchinis (peeling is optional, cut lengthwise into fourths, cut out the seeds, use a mandoline or the slicer on a grater to make little confetti strands the size of ribbons)
1 to 2 medium cucumbers (peel then prepare the same as the zucchini)
1 to 2 medium sweet onions (cut into slices and then mince or cut into small pieces)
1 to 2 sweet peppers (cut the stem out, cut lengthwise into fourths, cut out the seeds, and cut into this slices)
2 to 4 medium carrots (grated)
Several cherry or grape tomatoes (leave whole)
1 cup of fresh basil (tear into small pieces)
Spinach or tomato rotini or tortellini noodles, optional (cook, cool, add right before serving)
Italian or Balsamic Vinaigrette dressing

Prepare and combine all the ingredients. Mix thoroughly. Let it set in a cooler for at least 15 minutes to combine the flavors.

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6. **Harvest Pizza**

This is a sure way to get everyone to eat fruits and vegetables. You may want to make individual veggie pizzas using crackers, bagel bites, or even thick cut round slices of yellow zucchini or another summer squash that has been oiled, seasoned, grilled or broiled. For individual fruit pizzas you can use sugar cookies, graham crackers, or even zucchini or banana bread slices. We like to use the tube pizza crust or sugar cookie dough and form it into the state of Iowa, the vegetables or fruits we put on the pizza represent what can be grown and harvested in Iowa.

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**Vegetable Pizza**

Pizza crust (tube or mix, prepare and cool)
1 tub softened cream cheese, flavored or unflavored (spread on crust)
Fresh locally grown vegetables such as different colors of pepper pieces, cucumber slices, zucchini or summer squash pieces, shredded carrots or carrot medallions, finely chopped green onions, diced tomatoes that are well drained (add last), etc. (wash, drain, prepare and spread on crust)
Dill weed or other crushed herbs (sprinkle over top)
Ham or bacon bits (optional, sprinkle over top)
Shredded cheese of your choice, finely shredded and sprinkled over the pizza

You may want to chill the pizza for 20 minutes for the flavors to blend.
Fruit Pizza
Sugar cookie crust (tube or mix, prepare and cool)
1 tub of whipped topping (or mix tub with 3 oz. cream cheese, spread on crust)
Fresh locally grown fruits such as different colors and kinds of berries, thin
apple slices, pieces of cantaloupe, grapes cut in half, pear slices (added last),
raisins or craisins, cherries, peach pieces (added last), etc. (wash, drain,
prepare, and spread on crust.
Cinnamon (sprinkle lightly over top)
Sliced almonds (optional, sprinkle over top)
You may want to chill the pizza for 20 minutes for the flavors to blend.

7. Summer Garden Salsa
This has been a favorite recipe for thousands of youth participating in Iowa State
University Extension and Outreach’s Growing in the Garden program. All but the
last three ingredients can easily be grown in a summer garden. Tomatillos are fun to
grow and have been easy to purchase at the grocery store. They add a fun flavor to
the recipe and are unique because they look like a little green tomato growing inside
a husk. However, if you can’t find them, you can simply leave them out of the recipe.

Summer Garden Salsa
4 to 6 medium tomatoes (seeded and coarsely chopped)
1 small fresh jalapeno chile (seeded and minced (optional)
1 clove garlic (minced)
¼ cup finely chopped onions
2 tablespoons finely chopped cilantro
2 tomatillos (husks removed, finely chopped)
Juice from 1 small lime
¼ teaspoon salt
¼ teaspoon freshly ground black pepper
In a large bowl, combine all of the ingredients. Stir together until well blended.
Cover and chill for 30 minutes or more before serving. Keeps up to 4 days in the
refrigerator. Makes about 2 cups.

8. Veggie Vehicles
One of our garden educators remembered that someone sponsored a contest where her
son and his classmates designed mobile cars out of vegetables. You could do the same!
The students could use vegetables and vegetable pieces and tooth picks to assemble
their vehicles. Have a car or vehicle rally so they can show off their designs.

9. Sharing Ideas and Recipes
Maybe the youth and adult gardeners and partners at your site have some great sam-
pling or recipe ideas they would like to share. Or, you can search for fun recipes on
the Internet. Offer them the opportunity and cook up something new! Then share
the ideas and recipes with other gardeners through the internet, in the newspaper, or
through one-on-one communications via email, phone, or letters.
10. Share the Harvest

Do you have extra garden vegetables and fruits? Send them home with the young gardeners. It is very helpful to also send washing and storing information and serving tips. Explore other ways to share your garden harvest such as food pantries, summer meal programs, senior centers, other families, etc. The students can come up with the ideas and then check to make sure those places will accept garden produce.

RESOURCES FOR GARDEN CROP INFORMATION AND RECIPES

Harvest of the Month from the Network for a Healthy California
http://www.harvestofthemonth.cdph.ca.gov
 click on the “Download Monthly Elements” icon and find a crop that you want to learn about and eat

Garden Mosaics: Connecting youth and elders to investigate the mosaics of plants, people, and cultures in gardens, from the American Community Gardening Association
http://communitygardennews.org/gardenmosaics/ or enter gardenmosaics.org
 click on Science Pages, English or Spanish Version, and find a crop in the Plants list that you would like to learn about and eat

Got Veggies? from the Nutrition, Physical Activity and Obesity Program, Wisconsin Department of Health Services
www.dhs.wisconsin.gov/health/physicalactivity/pdf_files/ or search for Got Veggies, go to the Cooking and Eating in the Garden pages

Contact your local extension service or the state extension service at your land grant university. In Iowa, go to
www.extension.iastate.edu.
Harvesting Your Healthy Garden

You will be custom designing your own harvest lesson titled “Harvesting Your Healthy Garden”. Please follow the following steps.

HARVESTING

If you are harvesting your own garden, please follow these steps.

1. Find the crops you are harvesting in the School Garden Harvesting Guide and the Harvesting and Storing Vegetables chart. Read when and how to harvest the crops and find the supplies you will need. If you have the original seed packets or plant labels, they may provide harvest information such as, “Harvest the peppers after they have turned from yellow to red.” Clean paper bags make good collection tools because the students can write on the outside of the bag – the name of the crop, the harvest date, and the yield (how many or how much it weighed). You can use the bag again for the next harvest.

2. With the students, please review the following Harvest Rules adapted from the United States Department of Agriculture’s Food Safety Tips for School Gardens. You may want to post these rules where everyone can see them each time they work with food from the garden.

<table>
<thead>
<tr>
<th>Harvest Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R</strong>espect yourself and others by not working in the garden or preparing food if you are sick or until 24 hours after the symptoms have stopped.</td>
</tr>
<tr>
<td><strong>U</strong>se soap and clean water to wash your hands for at least 10 to 15 seconds before and after gardening and handling food. Make sure all wounds are covered. Consider using disposable gloves, especially if they fit your hands.</td>
</tr>
<tr>
<td><strong>L</strong>essen the risk of injury by wearing closed-toed shoes and consider wearing something to protect your skin from the sun.</td>
</tr>
<tr>
<td><strong>E</strong>xamine the harvesting tools, storage containers, and cooking supplies for cleanliness. Wash them with clean, warm, soapy water before and after usage. Do not use containers that previously held chemicals.</td>
</tr>
<tr>
<td><strong>S</strong>ecure the safety and quantity of your food supply by harvesting the garden regularly and removing any produce that is rotten or has been contaminated by insects or animals.</td>
</tr>
</tbody>
</table>
3. Copy the **Garden Record**, one per student, or project it on an interactive board, screen or large flip chart. If the students have already been keeping a garden journal or record, please continue to use the original one and especially refer to it for planting information. The original ones could be available from the 4th grade teacher who worked with the garden program last year. Review the information that they will need to record when they harvest the garden. Discuss how the information will be collected. Will they count numbers of harvested produce per plant or crop or will they weigh the produce? Will they individually write information on their paper collection bags when they are out in the garden or will they bring all the produce to one spot and count or weigh it with help from the rest of the group?

4. Go to the garden as a group and look at each of the crops to discuss whether they are ready to be harvested. Read the instructions on how to harvest the crop and have one student demonstrate to the rest of the class. After looking at the entire garden, organize how you would like to harvest the mature crops so that everyone gets a chance to harvest something. Produce tastes so good straight from the garden. You may want to wash and eat a small sample of some of the crops you harvest. Save enough to make one of the recipes.

5. Be sure to record the harvest information on the Garden Record.

**If you do not have your own garden and have purchased produce from local farmer’s markets, produce stands, or grocery stores, please explore harvesting this way.**

Copy the Garden Record, one per student, or project it on an interactive board, screen or large flip chart. Show one sample of each of the crops from the local market. Have the students write down the name of the crops on the Garden Record. Talk about where the crop was grown, if anyone has grown the crop or eaten it before. Discuss and predict how many tomatoes, peppers, potatoes, beans, etc. might come from one plant and how many plants they might like to grow in a 4’ x 8’ garden. Record the predictions on the Garden Record. You may want to refer to the School Garden Harvesting Guide and the Harvesting and Storing Vegetables chart for additional information.

**PREPARING AND EATING FOOD FROM THE GARDEN**

**Use the garden produce the students have harvested or that has been purchased or donated from a local farmer’s market, produce stand, or grocery store.**

1. Decide how you would like to use the garden produce. Would you like to prepare and eat it yourselves? Or, would you like to host a Harvest Party with family members? Using the **Harvest Recipes** as a guide, what recipes would you like to prepare and how much food will you need? If you are having a Harvest Party, make plans for the party and design clever invitations.
2. Referring to the **Harvest Recipes**, select at least one recipe that includes the garden produce you harvested or purchased and that the students would like to make and eat. Make sure you have the right supplies for the recipes. Review and follow the food safety rules listed in Harvest Rules found in number 2 of the first section of this lesson. Demonstrate how the students will wash the produce and prepare it for the recipe. Show how to safely peel, cut or slice produce with the knife or grater blade going down towards the cutting board and with your fingers out of the way. School foodservice staff would be good leaders for this activity.

3. Organize the students so everyone has a task, make sure everyone is following the Harvest Rules, and make the recipes according to the directions.

**REVIEW**
This section of the lesson is to be completed after the harvest, food preparation and eating is done.

1. Use the information on your Garden Record and do some of the math activities found on page 2 of the Garden Record.

2. Discuss what the students learned, what they liked and didn’t like, what they want to do next as a result of their new experiences. Be sure to talk about and record what the students would like to grow in their next garden. You may also want to talk about where and how they can get involved in helping their families and others in the community have access to these tasty and healthy local foods. Participating in farmer’s markets, community gardens, food pantries, family or neighborhood gardens, cooking classes, community meals are examples of these opportunities.
# Student Garden Record

Teacher: ___________________________  Grade: __________________

Date(s) garden was planted: ___________________________

<table>
<thead>
<tr>
<th>Crop</th>
<th>Amount planted</th>
<th>Approximate amount harvested and date?</th>
<th>How was it used?</th>
</tr>
</thead>
</table>
| Example: radishes | 10 feet of row or 2 square feet or one 2.5 gram packet | 32 radishes on May 20 27 radishes on May 25 | ☐ Donated to the soup, kitchen/community  
☐ Used classrooms for snacks  
☐ Ate as a snack in the garden  
☐ Shared with school cafeteria  
☐ Sent home with children  
☐ Sold for profit |
| Example: lettuce | 16 feet of row or 4 square feet or one 1 gram packet | 2 pounds on May 16 1 pound on May 25 | ☐ Donated to the soup, kitchen/community  
☐ Used classrooms for snacks  
☐ Ate as a snack in the garden  
☐ Shared with school cafeteria  
☐ Sent home with children  
☐ Sold for profit |

Example: radishes  
Example: lettuce

<table>
<thead>
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Example: radishes  
Example: lettuce
Harvest Math

There are a lot of things you can do with the data you collect from your garden. It makes great applicable math problems. Below are a few examples.

1. How many days did it take radishes, onions, tomatoes, etc. to grow until they were ready for harvest (from the time they were planted until the first ripe/mature one was ready)? Use a calendar to help you count. Was that the same as was given on the seed package? Make a chart to see how close your crops were to the estimated of days. Why do you think yours were earlier or later? (Possible reasons: weather – warmer or colder; planting depth – too deep; too much or too little water; lack of adequate light, etc.)

2. If your garden is a 4 ft. x 8 ft. raised bed, it contains 32 square feet. Using your garden plan, determine how much space each crop took and turn that into a pie chart. See example below:

   Tomatoes – 12 sq. feet (12/32 = 3/8 = 38%)
   Radishes – 8 sq. feet (8/32 = ¼ = 25%)
   Lettuce – 8 sq. feet (8/32 = ¼ = 25%)
   Cucumbers – 4 sq. feet (4/32 = 1/8 = 12%)

3. Calculate potential value of the crop. Example: If you harvested 12 pounds of tomatoes and the price at the market is $2.50 per pound, what is the value of your tomato crop? $30. Make a chart using the data and determine what crops would be the most valuable.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield</th>
<th>Market value</th>
<th>Gross profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples: tomatoes</td>
<td>12 pounds</td>
<td>$2.50/lb</td>
<td>$30</td>
</tr>
<tr>
<td>Cucumbers</td>
<td>22 cucumbers</td>
<td>.75 each</td>
<td>$16.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$46.50</strong></td>
</tr>
</tbody>
</table>
Lesson Two: What do you do with the garden after the harvest?

For October

“Putting Your Garden to Bed” from Healthy Gardens, Healthy Youth Content and Delivery Team and Composting from GARDEN MOSAICS, American Community Gardening Association and Cornell Garden-based Learning.

It’s time to put the garden to bed, if you didn’t do that last month. Students learn about tool safety, cover cropping and composting. Included are options to building your own compost bin, and plant a winter crop.

Content objectives: Describe how gardeners and farmers care for the soil so that they can grow healthy, edible crops during the next growing; identify steps to put your garden to bed in a way to prepare the soil for the next harvest; understand how composting improves soil.

Life Skill objectives: Healthy living, Critical thinking, Communication, Cooperation, Leadership, Decision making, Problem solving

Core and STEM concepts and skills:
Science: Science as inquiry, Earth and space, Life science
Math: Measurement and observation
Language Arts: Speaking, Listening, Writing, Viewing
Social Studies: Behavioral sciences

Healthy snack: Choose snack from Grade 5 Lesson 1 options

Additional and supporting resources:
Contact your local Cooperative Extension Master Gardner Program for additional information.
LESSON PLANS FOR 2012-13 SCHOOL YEAR, GRADE 5

October: Post Harvest: What do you do with the garden after the harvest?

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Lesson Part One: Putting Your Garden to Bed
Healthy Gardens, Healthy Youth Content and Delivery Team (*found in the Lesson Plan Outline*)

Lesson Part Two: Composting from *Garden Mosaics, American Community Gardening Association and Cornell Garden-based Learning*

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BEFORE THE LESSON
Is it time to put your garden to bed for a while? Do you want to learn how gardeners and farmers care for the soil so that they can grow healthy, edible crops during the next growing season? All of the following items will help you put your garden to bed in a way to prepare the soil for the next harvest. Garden experts say that if you could choose one thing to do to improve your garden for the next growing season, building a compost pile or bin would be your wisest decision. Extension Master Gardeners and other local garden experts can help you to do that.

1. Grade 3, October: Post Harvest
This document contains all the curriculum items and resources you need for this lesson. All lesson downloads are located on the www.peoplesgarden.wsu.edu Educational Toolkit.

2. Put Your Garden To Bed, University of Maryland Extension
Improve Your Soil with Cover Crops, Cornell University Department of Horticulture Questions About Composting, Iowa State University Extension and Outreach
Tool Safety Game, Iowa State University Extension and Outreach, Growing in the Garden Please read and use these resources as guides for post harvest gardening activities. You may copy these resources to send home with the students.

3. Garden Records or Garden Journals
Start a page for the garden records or garden journals to describe or draw your post harvest activities. You may want to start the page with the goals you want to accomplish to prepare the garden for next year. Then explain how you think the post harvest activities will help you to reach your goals. If you haven’t started a Garden Journal, this would be a good time.

4. Post - Harvest Recipes
Select a recipe from the Grade 5 September lesson Harvest Sampling Ideas and Recipes that includes garden produce you have harvested or fresh produce that could be from a garden near where you live. Be prepared to have the students help to prepare and eat it.

THE LESSONS
Because every garden and gardening situation is different, the first part of this lesson requires you to read the resources from Before the Lesson, Item 2 and then choose the activities and tools that your students will use to actually put their garden to bed. Please highlight the activities and tools that are most appropriate for your location, garden, and students. Then you are ready to work with the students to actually put their garden to bed for the season. This should take one session. If you do not have a garden to put to bed, you can tour local gardens or even farm fields to observe what is going on and you can discuss what you would do in a garden.

Part Two of this lesson will include composting activities done on another day.
1. Part One: Putting Your Garden to Bed
   A. What can your students do from the "Put Your Garden to Bed" resource to actually put their garden to bed? Highlight the activities that seem to match your garden situation and think about how the students can do those activities.

   B. Do you want to try cover cropping from "Improving Your Soil with Cover Crops"? You may want to ask Master Gardeners or local garden experts if that is a good idea and what cover crop to plant in your location. It is difficult to till the cover crops back into the soil in a raised bed. If this is a workable option for your gardens, select the appropriate cover crop and be ready to have the students plant it.

   C. Do you want to build a compost bin to do something with the plants left from harvest and to improve the soil for next year? "Questions About Composting" will help you to decide. The students will learn more about composting in Part Two of this lesson. If a compost bin is not quite ready when you are putting the garden to bed, pile the plants in a place to add to your compost bin in the future.

   D. Review the student activities that you highlighted and consider the tools they will be using for those gardening activities. Look for those tools in the "Tool Safety Game" and play the game before the students work together to put their garden to bed.

2. Part Two: Composting
   This lesson from Garden Mosaics (page 11) defines and describe composting and introduces a way to put together a simple compost bin. You may want to work with Master Gardeners or other experienced gardeners to decide what type of a composting bin would work best for your site. The students can help to assemble and start the composting project. Consider collaborating with other classrooms on this project or expanding the composting project to the entire school.

3. You may want to expand the lesson by inviting someone from your city or county to talk about the composting that they do. Ask local gardeners about the impact of composting on the plants that they grow. Share what you have learned through posters that you can display around town to encourage people to compost.

   **AFTER THE LESSON**
   Keep composting!
   You may want to tour some gardens, fields, composting projects in your area.
When Fall crops and flowers have matured, it is time to put your garden to bed. Get started with these tips for cleaning your garden, setting it right for the winter, and laying the groundwork for next year’s garden:

- Plant perennial rhubarb roots October 15 through November 15. Plant Spring flowering bulbs, such as tulips and daffodils, in October. Other perennial flowers, such as peonies, do best when planted in the fall, too.
- Pot up parsley, chives, geraniums and other herbs and flowers. Keep them out of doors for a few weeks in their pots. Then bring them in and place them in a sunny window for production throughout the winter.
- Harvest and preserve fall crops.
- Cover tomatoes and other warm season crops with plastic in the evening to protect them from light frosts. Remove the plastic in the morning so heat does not build up under it and damage the plants.
- Mulch and protect hardy crops, such as greens and root crops, so they will last longer. Pile mulch over and around plants to insulate them.
- Remove old, spent plants from the garden. Any plants that had insects or disease should be put in plastic bags and thrown out with the trash. Others can be composted.
- Make needed structural changes, such as leveling or building raised beds. Turn the soil and leave it rough to expose insects and disease to the cold. It will kill some of them.
- Mow tall grasses around the garden and use them (or other materials) to mulch the ground before it begins to freeze (late November) to prevent erosion.
- Take a soil test and add any needed limestone to the garden so it will break down and do its job by spring.
- Wait until spring to fertilize.
- Make compost from fallen leaves, kitchen vegetable scraps, garden waste, and other organic matter in an enclosed container. Call the Extension Service for directions on making compost.
- Add organic matter (compost, leaves, grass clippings) to improve the condition of the soil.
- Be sure to clean up your garden so it will look neat and clean for the winter.

Now sit back and wait for your seed catalogues to come and start planning for next season.

From: University of Maryland Extension
http://mastergardener.umd.edu/local/charles/Horticulture%20Know_how/Put%20Your%20Garden%20to%20Bed.cfm  Accessed 8/1/2012
Cornell gardening resources
Improve Your Soil with Cover Crops
Ecogardening Factsheet #9, Spring 1993

At the end of the growing season you may be ready to rest, but your garden is not. One final effort can make a big difference: cover cropping. Even small gardens will benefit from the use of cover crops, or "green manures". Tilling, weeding, harvesting and foot traffic of most home gardens tends to destroy soil structure. Planting cover crops is an easy way to revitalize the soil, and help soil tilth and subsequent plant growth. Cover crops are planted in vacant space and worked into the soil after they grow instead of being eaten. They provide a number of advantages to the otherwise wasteful use of space during your garden's off-season.

Cover crops help to retain the soil, lessen erosion, and decrease the impact of precipitation on the garden by slowing the runoff of water. They also reduce mineral leaching and compaction, and suppress perennial and winter annual weed growth. The top growth adds organic matter when it is tilled into the garden soil. The cover crop's root system also provides organic matter and opens passageways that help improve air and water movement in the soil.

Success in the growth of cover crops requires proper selection of the kind of cover crop, correct timing of seeding, and good management techniques. There are many traditional cover crops to select from, including annual ryegrass, winter rye, winter wheat, oats, white clover, sweet clover, hairy vetch and buckwheat. Grasses are easier to grow than legumes such as clover because they germinate more quickly and do not require inoculation. Small seeded crops are more difficult to establish than large seeded types such as oats and buckwheat. In poorly drained areas, grasses may be easier to get started. Winter rye and ryegrass grow in a very dense habit and are much more effective at shading out weeds than oats or small seeded legumes. Availability of seed and cost are other important considerations.

If sections of the garden are free during late spring or early summer, clovers, fescue or buckwheat can be planted. If garden space is available in August, barley, annual ryegrass, oats, and clover can be successfully established. The last date when cover crops can be planted in New York will vary with the region, but most New York gardeners should plan to plant cover crops by the end of September. By the beginning of October, only rye and winter wheat can be productively started.

Cover crops such as annual ryegrass, oats, and buckwheat do not overwinter. These crops are the easiest to work with when spring arrives since their tops have died back during the winter. Perennial ryegrass and winter rye produce a massive amount of top growth in the spring and may be difficult to incorporate. However, perennial grasses are an advantage in wet areas, since the soil will dry more rapidly than a soil with winterkilled crops. If this is the case, before the leaves grow too tall in the spring they should be cut back once with a mower or scythe.
Given all of the above information, how does one choose? For New York conditions, annual ryegrass should be considered first for a garden cover crop. It is a vigorous grower with an extensive root system that occupies the same root zone as the garden plants. Winter rye is another good choice that is best for late planting.

To plant a cover crop, rake the garden area smooth and remove debris or large stones. Broadcast the seed according to the rates on the chart below. Lightly rake again, and water in the cover crop with your hose set at a fine mist.

The following chart provides an overview of the cover crops at a glance. Seed can be purchased at your local garden center or farm store.

<table>
<thead>
<tr>
<th>POPULAR AND USEFUL CHOICES OF COVER CROPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vigor of germination &amp; establishment</td>
</tr>
<tr>
<td>Annual Ryegrass</td>
</tr>
<tr>
<td>Perennial Ryegrass</td>
</tr>
<tr>
<td>Winter Rye</td>
</tr>
<tr>
<td>Oats</td>
</tr>
<tr>
<td>Winter Wheat</td>
</tr>
<tr>
<td>Species</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Sweet Clover</td>
</tr>
<tr>
<td>White Clover</td>
</tr>
<tr>
<td>Tall Fescue</td>
</tr>
<tr>
<td>Buckwheat</td>
</tr>
</tbody>
</table>

- ** = Relatively High
- *** = Moderate
- * = Relatively Low

Note: Packages of Ryegrass Usually Contain a Mixture of Annual & Perennial Types
How long does it take to reach a finished product?
Generally, a compost pile that contains a good mixture of finely chopped materials, is turned regularly and kept moist, will be ready in about 2 to 4 months. A compost pile composed of non-shredded materials that is left unattended may take a year or longer to decompose. Piles prepared in late fall will not be very well decomposed by spring. When the compost is finished, the pile will be about half its original size and have a pleasant, earthy smell.

Of what value or use is the finished compost product?
Compost is used as an organic amendment to improve the physical, chemical and biological properties of soils. For example, adding compost to garden soil will increase the moisture holding capacity of sandy soils and improve the drainage and aeration of heavy clay soils. Over time, yearly additions of compost will create desirable soil structure making the soil easier to work.

Will compost eliminate the need for commercial fertilizers in my garden?
To a limited extent, compost is a source of nutrients. However, nutrient release from compost is slow and the nutrient content is often too low to supply all the nutrients necessary for plant growth. Compost should not be considered a substitute for fertilizer, but rather a supplement. Compost increases the ability of the soil to hold and release essential plant nutrients, especially in sandy soils. This may reduce the amount of fertilizers needed.

For more information
Horticultural information is available from your local Iowa State University Extension office and from these Web sites.

ISU Extension Distribution Center—
www.extension.iastate.edu/store

ISU Horticulture—
www.yardandgarden.extension.iastate.edu

Reiman Gardens—
www.reimangardens.iastate.edu

Prepared by Linda Naeve, former extension horticulturist; Richard Jauron, extension horticulturist; and Diane Nelson, extension communication specialist.
Can wood ashes from the fireplace be used in the compost pile?
Wood ashes act as a lime source and should only be added in small amounts (no more than 1 cup per bushel of compost).

Can kitchen scraps be added to a compost pile?
Certain kitchen scraps can be added to the compost pile, such as fruit and vegetable trimmings (including rhubarb leaves), coffee grounds and eggshells. Do not add meat scraps, bones, grease, whole eggs, or dairy products to the compost pile because they decompose slowly, cause odors, and can attract rodents.

What other things shouldn’t be added to a compost pile?
Because of the possibility of the transmission of certain diseases, human, dog, and cat feces should not be placed in compost piles. Also, diseased plant material or weeds that have gone to seed may be undesirable in the compost pile. If the temperature in the pile does not reach 150° to 160°F, neither the weed seeds nor the disease organisms will be destroyed. If diseased plant materials are composted, the end product may be better used in another area of the yard rather than in the garden where they were generated.

What kinds of materials can be composted?
Yard and garden residues and other organic materials are suitable for composting. This includes leaves, grass clippings, straw and hay, sawdust, and finely chopped or shredded tree and shrub prunings.

What is the optimum size for a compost pile?
The best size for an enclosed compost pile is between a 3’ x 3’ x 3’ pile and a 5’ x 5’ x 5’ pile. If any smaller, it will dry out too fast; any larger and there will be poor air movement and it will be difficult to turn the pile.

Can wood ashes from the fireplace be used in the compost pile?
Wood ashes act as a lime source and should only be added in small amounts (no more than 1 cup per bushel of compost).

If my lawn has been treated with herbicides, can I still use the clippings in my compost pile?
Composting is an accelerated decomposition process that biodegrades many compounds faster than soil degradation. The faster degradation in an active compost pile is due to the more favorable conditions for decomposition of organic products including herbicides. If yard waste has been composted at least one year, pesticide residues should not be a problem when the compost is used.

Can I compost my newspapers?
Yes. Most newspapers today use soybean-based or other non-toxic inks. To promote decomposition, shred newspapers and mix with other materials.

Why doesn’t a pile of leaves readily decompose?
It is best to have a mixture of organic materials together in the compost pile. Dry leaves are a high-carbon organic material. The microbes that do the decomposing require a certain amount of nitrogen for their own metabolism and growth. Without a nitrogen source, the decomposition will be slow. Grass clippings are high in nitrogen. When mixed together, the grass clippings will enhance the decomposition of the leaves.

Are commercially available inoculants or activators needed to have rapid decomposition in a compost pile?
Inoculants are dormant microorganisms. They are rarely needed, since soil, leaves, kitchen scraps, and finished compost already contain ample bacteria that readily work on their own. The only “activator” that may be needed is a nitrogen source since nitrogen is usually the limiting nutrient. Nitrogen accelerates the decomposition process if the materials to be composted are high in carbon, such as dried leaves.

How can I avoid problems with unpleasant odors from the compost pile?
Odors may arise from the addition of excessive amounts of wet plant materials such as fruits or grass clippings, from overwatering the pile, or by not periodically turning an actively decomposing pile. A properly prepared and adequately turned compost pile will generate little, if any, objectionable odor. Good aeration, provided by regularly turning over the materials in the pile, is essential for good, rapid decomposition. Also, keeping the compost damp but not waterlogged will go a long way toward preventing unpleasant odors. Adding lime does not necessarily reduce odors and may result in the loss of nitrogen from the pile.
I am going to show you some right ways and wrong ways to use and store our tools. If you think I’m showing you the right way, clap. If you think I’m showing you the wrong way, stomp your foot.

- **Lift the hoe so that the blade is over your head like you are swinging a hatchet.**
  
  _STOMP._
  
  I have lifted the hoe too high. I am not chopping the soil. I am hoeing it. It doesn’t work very well this way. Also, you may hit someone who is nearby if you swing the hoe this high in the air.

- **Lift the hoe so that it is about 1 foot off the ground and bring it down in a gliding motion through the surface of the soil.**
  
  _CLAP._
  
  This is the correct way to use the hoe to cut through crusty soil and remove weeds.

- **Repeat the same motions with the rake.**

- **Lay the rake down, teeth up.**
  
  _STOMP._
  
  You should never set a rake or a hoe on the ground like this. What do you think would happen? You may want to demonstrate what would happen if someone stepped on the teeth of the rake or blade of the hoe. Be careful to stand to the side so the handle doesn’t smack you in the face.

- **Stand the rake and hoe, handles up, against a wall or hang them.**
  
  _CLAP._
  
  Rakes and hoes should be stood against a wall or in the shed or garage when they are not being used.

- **Walk with the trowel blade up.**
  
  _STOMP._
  
  Always carry your tools such as this trowel with the sharp blade facing down.

- **Run a short distance holding a hoe and a trowel.**
  
  _STOMP._
  
  Never run with tools in your hands.

- **Pretend to wash dirt from the trowel, hoe, or shovel.**
  
  _CLAP._
  
  It is always a good idea to clean the soil off your tools before you put them away. This shows you are responsible for taking care of your tools.

- **Pretend to fight with a student over a trowel or hoe.**
  
  _STOMP._
  
  Show respect by taking turns.
GARDEN MOSAICS

COMPOSTING Teaching Tips

**LEARNING OBJECTIVES**

Youth will be able to:
* Define composting.
* Describe what compost organisms need to grow and multiply.
* Explain how to build and care for a compost pile.

**HOW TO USE THE COMPOSTING SCIENCE PAGE**

Ask youth what happens to their household food scraps, yard trimmings, and fallen leaves. Explain that these organic materials make up 20-40% of the total wastes that go to landfills and incinerators in the U.S. Yet these valuable resources could be composted to produce a soil amendment that can greatly improve garden soil.

Show youth various materials, some of which can be composted (for example, leaves, newspaper, and kitchen scraps) and others (for example, metal and plastics) which cannot decompose. Have the youth separate the materials into two piles, one with items that will decay, and another with items that will not decompose.

Show youth some finished compost. Let them feel and smell the compost. Ask: How did kitchen scraps and other compost materials become this rich, dark brown, sweet-smelling compost? (Answer: Microbes and physical processes (e.g., heat) broke down the materials into compost.)

Pick up a handful of compost, and tell youth that you are holding more microbes than there are people living on the earth. Although these microbes cannot be seen, evidence of their growth can be observed. If all of their needs are met, microbes grow and multiply very quickly, and turn vegetable scraps and yard wastes into compost. Tell youth that the Science Page contains information on what compost organisms need in order to produce compost.

Emphasize that the more ideal the conditions are for microbes in a compost pile, the faster the decay process. A compost pile can take from several days to several months to finish composting. Turning the pile will help ensure that all parts of the pile have enough air and moisture, which will speed up the decay process.

Explain that brown materials are usually much drier than the food scraps and other green materials in a compost pile. So they help to balance the moisture in a compost pile as well as provide carbon-rich food for microbes. The browns are also usually coarser than the greens, so they create a porous structure that allows air into the pile, and excess water to escape. Warn youth not to include meat, oily materials, dairy products, or bones in the green layers. They may attract pests to the compost pile.


**CROSSWORD PUZZLE**

**Answers:** Across: 2. browns; 4. compost; 6. heat; 7. three. Down: 1. bacteria; 3. water; 5. greens.

**TRY THIS**

Ask youth to keep a pail or other container in their kitchen for collecting food scraps. Line the container with newspaper to make it easier to empty and to clean. Ask: What items can you collect in your compost bucket? (Answer: Vegetable or fruit scraps, coffee grounds, tea bags, and crushed egg shells.) Ask: What items should not be put in the compost bucket? (Answer: meat, fat, dairy products, bones, or raw eggs.) Explain that cutting up the food scraps into smaller pieces will make them rot faster.

Discuss where you can find local sources of browns, such as straw, dried leaves, sawdust, or newspaper. Remind youth that they need to have three times as many browns as greens. Ask everyone to collect and bring in greens and browns to add to the compost pile.

Emphasize the importance of size of the compost pile. Ask: What would happen if the compost pile were smaller than one cubic meter? (Answer: It would lose heat, so the composting process would be slowed down.) Talk about the importance of moisture and air in the pile. Ask: How can we make sure that the compost organisms have enough air and moisture? (Answer: Make sure the pile stays moist as a damp sponge. Turn it at least once a week so that all parts of the pile get enough moisture and air.)

Schedule times for youth to turn the pile once a week. Once the compost is finished, youth may wish to use it in a garden, or for potted plants.

**SPOTLIGHT ON RESEARCH**

WHAT IS COMPOSTING?
Composting is the controlled decay of plant and animal matter to produce compost—a dark, rich soil-like material. Compost can be added to soil to improve its structure and nutrient content.

In nature, bacteria, fungi, worms, and other soil organisms help to break down dead plants and animals, as well as animal wastes. The decomposed organic material becomes part of the soil. This natural decay process usually takes place very slowly.

Leaves that fall to the forest floor slowly decay to form part of the organic matter in soil.

Composters create ideal growing conditions for compost organisms. This speeds up the natural decay process.

WHAT COMPOST ORGANISMS NEED

1. **A balanced diet of compost materials**
   "Browns" are compost materials that are brown and dry.
   "Greens" are compost materials that are green and moist.
   "Browns" are high in carbon, which is energy food for microbes.
   "Greens" are high in nitrogen, which microbes need to make proteins.
   If I add about 3 parts browns to 1 part greens, then the compost organisms will have a balanced diet.

2. **Just the right amount of air and water**
   If there’s the right amount of oxygen and moisture, microbes can rapidly grow and multiply. Too much—or too little—water, and microbes will die.
   Compost materials should have a thin film of water around them, and lots of pore spaces filled with air.

3. **The right temperature**
   Organic materials will eventually decay, even in a cold compost pile. But the decay process is speeded up in a hot compost pile. When bacteria and fungi grow rapidly, they burn a lot of food, and give off a lot of heat. If the compost pile is big enough, the heat will build up inside the pile. Bacteria that grow well at high temperatures take over and speed up the decay process.

   | compost material | film of water | air |
   --- | --- | --- |
   A compost pile that is about one cubic meter (1m x 1m x 1m) in size is big enough to hold in heat and warm up.

   This compost pile is not big enough to retain heat, so it stays cool.

I’m mixing my compost pile so that all the compost organisms get enough air and water.
**CROSSWORD PUZZLE**

**Across**
2. Compost materials that are high in carbon.
4. Dark, rich, soil-like material.
6. A compost pile should be big enough so _______ builds up inside it.
7. A balanced diet for microbes is about _______ parts browns to one part greens.

**Down**
1. Microbes that help break down plant and animal matter.
3. Compost organisms need just the right amount of ________.
5. Compost materials that microbes use to make proteins.
6. A balanced diet for microbes is about _______ parts browns to one part greens.

---

**TRY THIS**

**BUILD A COMPOST PILE**

**What you need**
* 3-meter length of wire mesh fencing
* wire cutters
* twist ties
* compost materials
* duct tape

**What to do**
1. Choose a site to set up your compost bin. Try to find a shady, well-drained, level place that is convenient.
2. Snip off the fencing close to the cross wires and cover the sharp ends with duct tape to avoid getting scratched. Lap the ends of the fencing together and tie together with twist-ties to make a cylinder one meter high and one meter in diameter.
3. Put a layer of twigs in the bottom of the bin to help air to reach the center of the pile.
4. As you collect compost materials, layer them in the compost pile, as shown in the picture.
5. Stir or turn the compost every week or so to let in more air. To reach the compost, undo the twist-ties and open the fencing.
6. The length of time it takes for compost to be ready depends on many factors, such as weather conditions, the type of materials included, and the amount of turning. If you want your compost to be finished faster, keep it moist and turn it a couple of times a week. Finished compost is about one-third or less of its original size, dark brown, and has a nice, earthy odor. Green layers should be no more than 3-5 cm thick. Brown layers should be 2-3 times as thick as green layers. Start with a brown layer, then a green layer, then a brown layer, and so on. Always end with a brown layer so that wastes are covered.

**RIDDLE**

Why did the gardener bury money in his compost pile?

**Answer: Because he wanted his soil to be rich!**

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Garden Mosaics is funded by the National Science Foundation Informal Science Education program, and by the College of Agriculture and Life Sciences at Cornell University.
Lesson Three: What do you do with fall harvest crops such as pears and root vegetables?

For November

“Pears” and “Root Vegetables” from HARVEST OF THE MONTH: Network for a Healthy California.

Students learn facts about pears and root vegetables – how they grow, the nutrient content, history – and conduct experiments on ripening pears or dense and loose soil.

Content objectives: Identify key nutrients in pears and root vegetables; recognize reasons to eat pears and root vegetables; describe how pears and root vegetable grow; understand how fruits and vegetables ripen.

Life Skill objectives: Healthy living, Critical thinking, Communication, Cooperation, Decision making, Problem solving, Keeping record

Core and STEM concepts and skills:
Science: Science as inquiry, Earth and space, Life science
Math: Measurement and observation, Data
Language Arts: Speaking, Listening, Writing, Viewing
Social Studies: Geography, History

Healthy snack: Party Pear Frisbee, Jicama Cucumber Salad

Additional and supporting resources: Additional resources are listed in each Harvest of the Month section.
LESSON PLANS FOR 2012-13 SCHOOL YEAR, GRADE 5

November: What do you do with fall harvest crops such as pears and root vegetables?

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Grade 5-6 Lesson 3 November
BEFORE THE LESSON
Apples may be the most popular fruit crop that comes from trees. However, pears are also a popular fruit crop that comes from trees. If you look at the ingredient label on many fruit juices, you will find that pear juice is used to combine the main flavors of the juice. There are many popular root crops that are harvested in the fall. Thanks to the Network for a Healthy California Harvest of the Month [www.harvestofthemonth.cdph.ca.gov](http://www.harvestofthemonth.cdph.ca.gov) website, we were able to find educator newsletters that included information, recipes, and activities about these two popular fall crops.

1. **Grade 5, November: Pears and Root Vegetables**
This document contains all the curriculum items and resources you need for this lesson. All lesson downloads are located on the [www.peoplesgarden.wsu.edu](http://www.peoplesgarden.wsu.edu) Educational Toolkit.

2. **FIGHT BAC: Six Steps to Safer Fruits and Vegetables** is a brochure from Partnership for the Food Safety Education that focuses on tips to keep fruits and vegetable safe to eat and to prevent foodborne illness.

**FIGHT BAC: Four Simple Steps to Food Safety** is a brochure from North Dakota State University Extension Service that lists tips to clean, separate, cook, and chill food, including fruits and vegetables, to prevent foodborne illness.

You might want to make a simple poster to display in the classroom to remind everyone that about these simple steps. Go over the relevant steps before starting the cooking portion of the lesson.

3. Garden Journals
If you are working with a Garden Journal, have the students prepare two KWL pages about Pears and Root Crops. Fold or divide the paper into thirds and write Know, Want to Know, and Learned at the top of the columns. Finish the first two columns before the lesson and the third column after the lesson. Have them keep the page in their Garden Journal.

4. Pears and Root Vegetables are two lessons that should be done on two different days or over multiple days to meet your class needs. Please read each of the lessons in plenty of time to think through the activities and gather the supplies.

5. **Pear and Root Vegetables Recipes**
Party Pear Frisbee and Jicama Cucumber Salad recipes are found in their respective lessons which should be done on different days. Be sure to have the ingredients and equipment ready to go before class. Think about how to organize the students and assign tasks to make and serve the recipes. The recipe calls for canned pears; however, you could use locally grown fresh pears. It is not likely that you will find locally grown jicama, but it is generally available in most grocery store produce aisles. Get enough so that everyone can taste plain jicama.

THE LESSONS

*Special note: We recommend doing the Pears and Root Vegetables lessons on separate days or multiple days according to your schedule.*
1. Remember to review the appropriate food safety steps for produce using the Fight BAC information before you do the cooking activities.

2. **Lesson Part One: Pears**
   A suggested lesson design is included just before the lesson resources from *Harvest of the Month: Pears*.

3. **Lesson Part Two: Root Vegetables**
   A suggested lesson design is included just before the lesson resources from *Harvest of the Month: Root Vegetables*.

4. You may want to expand the lesson by choosing other activities from *Harvest of the Month: Pears* or *Root Vegetables*.

**AFTER THE LESSON**
You may want to check out the fruit and vegetable harvest in your area by taking a field trip to an orchard, patch, garden, or field; by visiting a farmer’s market; or inviting a local grower to talk about the crops he or she grows. You can also visit the local grocery store and identify all the different varieties of pears and root vegetables in the produce aisle and then different ways they are sold in different parts of the grocery store.
Check

- Check to be sure that the fresh fruits and vegetables you buy are not bruised or damaged.
- Check that fresh cut fruits and vegetables like packaged salads and precut melons are refrigerated at the store before buying. Do not buy fresh cut items that are not refrigerated.

Clean

- Wash hands with warm water and soap for at least 20 seconds before and after handling fresh fruits and vegetables.
- Clean all surfaces and utensils with hot water and soap, including cutting boards, counter tops, peelers and knives that will touch fresh fruits or vegetables before and after food preparation.
- Rinse fresh fruits and vegetables under running tap water, including those with skins and rinds that are not eaten. Packaged fruits and vegetables labeled “ready-to-eat”, “washed” or “triple washed” need not be washed.
- Rub firm-skin fruits and vegetables under running tap water or scrub with a clean vegetable brush while rinsing with running tap water.
- Dry fruits and vegetables with a clean cloth towel or paper towel.
- Never use detergent or bleach to wash fresh fruits or vegetables. These products are not intended for consumption.

Separate

- When shopping, be sure fresh fruits and vegetables are separated from household chemicals and raw foods such as meat, poultry and seafood in your cart and in bags at checkout.
- Keep fresh fruits and vegetables separate from raw meat, poultry or seafood in your refrigerator.

- Separate fresh fruits and vegetables from raw meat, poultry and seafood. Do not use the same cutting board without cleaning with hot water and soap before and after preparing fresh fruits and vegetables.

Cook

- Cook or throw away fruits or vegetables that have touched raw meat, poultry, seafood or their juices.

Chill

- Refrigerate all cut, peeled or cooked fresh fruits and vegetables within two hours.

Throw Away

- Throw away fresh fruits and vegetables that have not been refrigerated within two hours of cutting, peeling or cooking.
- Remove and throw away bruised or damaged portions of fruits and vegetables when preparing to cook them or before eating them raw.
- Throw away any fruit or vegetable that will not be cooked if it has touched raw meat, poultry or seafood.
- If in doubt, throw it out!
The US food supply is among the safest in the world, but organisms that you can’t see, smell or taste – bacteria, viruses and tiny parasites – are everywhere in the environment. These microorganisms – called pathogens – can invade food and cause illness, sometimes severe and even life-threatening, especially in young children, older adults, persons with weakened immune systems and pregnant women.

Fresh fruits and vegetables are important to the health and well-being of Americans and we enjoy one of the safest supplies of fresh produce in the world. However, although low, the proportion of food-borne illness associated with fresh fruits and vegetables has increased over the last several years. As health and nutrition experts continue to recommend we add more fruits and vegetables to a healthy daily diet, it becomes increasingly important that consumers know how to handle them properly.

Handling fruits and vegetables safely is easy. Although an invisible enemy may be in your kitchen, by practicing the following recommendations you can Fight BAC!®
Be a BAC Fighter

Make the meals and snacks from your kitchen as safe as possible. **CLEAN:** wash hands and surfaces often; **SEPARATE:** don’t cross-contaminate; **COOK:** to proper temperatures, and **CHILL:** refrigerate promptly. Be a BAC Fighter and Fight BAC!®

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**SAFE COOKING TEMPERATURES**

*as measured with a food thermometer*

<table>
<thead>
<tr>
<th>Food Type</th>
<th>Internal Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ground Meat and Meat Mixtures</strong></td>
<td></td>
</tr>
<tr>
<td>Beef, Veal, Lamb, Pork</td>
<td>160°F</td>
</tr>
<tr>
<td>Chicken, Turkey</td>
<td>165°F</td>
</tr>
<tr>
<td><strong>Fresh Beef, Veal, Lamb</strong></td>
<td></td>
</tr>
<tr>
<td>Medium-rare</td>
<td>145°F*</td>
</tr>
<tr>
<td>Medium</td>
<td>160°F</td>
</tr>
<tr>
<td>Well-done</td>
<td>170°F</td>
</tr>
<tr>
<td><strong>Poultry</strong></td>
<td></td>
</tr>
<tr>
<td>Chicken and Turkey, whole</td>
<td>165°F</td>
</tr>
<tr>
<td>Poultry Parts</td>
<td>165°F</td>
</tr>
<tr>
<td>Duck and Goose</td>
<td>165°F</td>
</tr>
<tr>
<td>Stuffing (cooked alone or in bird)</td>
<td>165°F</td>
</tr>
<tr>
<td><strong>Fresh Pork</strong></td>
<td></td>
</tr>
<tr>
<td>Medium-rare</td>
<td>145°F*</td>
</tr>
<tr>
<td>Medium</td>
<td>160°F</td>
</tr>
<tr>
<td>Well-done</td>
<td>170°F</td>
</tr>
<tr>
<td><strong>Ham</strong></td>
<td></td>
</tr>
<tr>
<td>Fresh (raw)</td>
<td>160°F</td>
</tr>
<tr>
<td>Precooked (to reheat)</td>
<td>140°F</td>
</tr>
<tr>
<td><strong>Eggs and Egg Dishes</strong></td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td>Cook until yolk and white are firm</td>
</tr>
<tr>
<td>Egg Dishes</td>
<td>160°F</td>
</tr>
<tr>
<td><strong>Seafood</strong></td>
<td></td>
</tr>
<tr>
<td>Fin fish</td>
<td>145°F</td>
</tr>
<tr>
<td>or flesh is opaque and separates easily with fork</td>
<td></td>
</tr>
<tr>
<td>Shrimp, lox and crab</td>
<td>flesh pearly and opaque</td>
</tr>
<tr>
<td>Clams, oysters and mussels</td>
<td>shells open during cooking</td>
</tr>
<tr>
<td>Scallops</td>
<td>milky white or opaque and firm</td>
</tr>
<tr>
<td><strong>Leftovers and Casseroles</strong></td>
<td>165°F</td>
</tr>
</tbody>
</table>

*Allow three-minute rest time

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**Cooking food to the proper temperature kills harmful bacteria. So Fight BAC® by thoroughly cooking your food as follows:**

Apply the heat... and Fight BAC!®

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For More Information about Safe Food Handling and Preparation

USDA’s Meat and Poultry Hotline
1-888-MPHotline (1-888-674-6854);
TTY 1-800-256-7072

www.foodsafety.gov

FDA’s Food Information and Seafood Hotline
1-800-332-4010

Partnership for Food Safety Education Web Site
www.fightbac.org

NDSU Extension Service
www.ag.ndsu.edu/food

Or contact your local cooperative extension office.

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Sign up to be a BACFighter at www.fightbac.org

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2005 PFSE

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FIGHT FOODBORNE BACTERIA

Four Simple Steps to Food Safety

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NDSU EXTENSION SERVICE

North Dakota State University
Reviewed and Reprinted APRIL 2012
**BAC** (foodborne bacteria) could make you and those you care about sick. In fact, even though you can’t see BAC—or smell him, or feel him—he and millions more like him may have already invaded the food you eat. But you have the power to **Fight BAC**!

Foodborne illness can strike anyone. Some people are at a higher risk for developing foodborne illness, including pregnant women, young children, older adults and people with weakened immune systems. For these people the following four simple steps are critically important:

**SEPARATE:** Don’t cross-contaminate

Cross-contamination is how bacteria can be spread. When handling raw meat, poultry, seafood and eggs, keep these foods and their juices away from ready-to-eat foods. Always start with a clean scene—wash hands with warm water and soap. Wash cutting boards, dishes, countertops and utensils with hot soapy water.

- Separate raw meat, poultry, seafood and eggs from other foods in your grocery shopping cart, grocery bags and in your refrigerator.
- Use one cutting board for fresh produce and a separate one for raw meat, poultry and seafood.
- Never place cooked food on a plate that previously held raw meat, poultry, seafood or eggs.

**COOK:** Cook to proper temperatures

Food is safely cooked when it reaches a high enough internal temperature to kill the harmful bacteria that cause illness. Refer to the chart on the back of this brochure for the proper internal temperatures.

- Use a food thermometer to measure the internal temperature of cooked foods. Make sure that meat, poultry, egg dishes, casseroles and other foods are cooked to the internal temperature shown in the chart on the back of this brochure.
- Cook ground meat or ground poultry until it reaches a safe internal temperature. Color is not a reliable indicator of doneness.
- Cook eggs until the yolk and white are firm. Only use recipes in which eggs are cooked or heated thoroughly.
- When cooking in a microwave oven, cover food, stir and rotate for even cooking. Food is done when it reaches the internal temperature shown on the back of this brochure.
- Bring sauces, soups and gravy to a boil when reheating.

**CHILL:** Refrigerate promptly

Refrigerate foods quickly because cold temperatures slow the growth of harmful bacteria. Do not over-stuff the refrigerator. Cold air must circulate to help keep food safe. Keeping a constant refrigerator temperature of 40°F or below is one of the most effective ways to reduce the risk of foodborne illness. Use an appliance thermometer to be sure the temperature is consistently 40°F or below. The freezer temperature should be 0°F or below.

- Refrigerate or freeze meat, poultry, eggs and other perishables as soon as you get them home from the store.
- Never let raw meat, poultry, eggs, cooked food or cut fresh fruits or vegetables sit at room temperature more than two hours before putting them in the refrigerator or freezer (one hour when the temperature is above 90°F).
- Never defrost food at room temperature. Food must be kept at a safe temperature during thawing. There are three safe ways to defrost food: in the refrigerator, in cold water, and in the microwave. Food thawed in cold water or in the microwave should be cooked immediately.
- Always marinate food in the refrigerator.
- Divide large amounts of leftovers into shallow containers for quicker cooling in the refrigerator.
- Use or discard refrigerated food on a regular basis. Check USDA cold storage information at [www.fightbac.org](http://www.fightbac.org) for optimum storage times.

**CLEAN:** Wash hands and surfaces often

Bacteria can be spread throughout the kitchen and get onto hands, cutting boards, utensils, counter tops and food. To **Fight BAC**, always:

- Wash your hands with warm water and soap for at least 20 seconds before and after handling food and after using the bathroom, changing diapers and handling pets.
- Wash your cutting boards, dishes, utensils and counter tops with hot soapy water after preparing each food item and before you go on to the next food.
- Consider using paper towels to clean up kitchen surfaces. If you use cloth towels wash them often in the hot cycle of your washing machine.
- Rinse fresh fruits and vegetables under running tap water, including those with skins and rinds that are not eaten.
- Rub firm-skin fruits and vegetables under running tap water or scrub with a clean vegetable brush while rinsing with running tap water.
Lesson Part One: Pears
The following recommended activities are from *Harvest of the Month: Pears*.

A. Page 2, “Just the Facts” and the pear diagram (question 8): Reveal the facts after asking the following questions (or have the students research these questions).

1.) Bartlett, Anjou and Bosc are examples of varieties of pears. What is your guess on how many varieties of pears are grown in the United States?

2.) If the state of Washington is the leading apple-growing state, what state is the leading pear growing state?

3.) What is the most popular variety of pear and is the most common canned pear?

4.) Is it better to pick pears from the tree when they are at the peak of ripeness or a little before?

5.) What part of the pear contains the most beneficial nutrients?

6.) Besides eating fresh pears, how else do we eat pears?

7.) What do pears have to do with clarinets and oboes?

8.) What body parts do pears and people have in common? *(Where everyone can see it, draw a diagram similar to the one on page 2 of the cross-section of the pear. Have the students guess where the parts are and then label them. The common parts are shoulder, flesh, and skin. Calyx is spelled and pronounced differently than the cowlick we find in our hair.)*

B. Page 4, “Adventurous Activities”: Do the Science Investigation to see how quickly pears ripen in different environments. Try to purchase pears that seem to be at the same stage of ripeness. To solve the problem, turn the experiment into a math activity and record your results on a graph with the number of days it took to ripen and types of environments. What method would you use to ripen pears at home? Wrap it up with a couple of healthy activities. Wash and eat the results of your experiment. While eating, talk about ways to increase walking as a good physical activity. Refer to the Calendar Connection and see if your community celebrates Walk to School Week.

C. Page 1: Ask the students to list why it is good to eat pears and read the “Reasons to Eat Pears.” Make the “Party Pear Frisbee” recipe and enjoy eating it! You may want to substitute fresh pears, put them directly on the rice cake and top with a teaspoon of yogurt.

D. Page 3: Work with the school cafeteria by doing something from the “Cafeteria Connections” or “School Garden: Composting” suggestions.
Health and Learning Success Go Hand-In-Hand

School-based nutrition education promoting healthful eating and physical activity can improve academic performance. Harvest of the Month connects with core curricula to give students the chance to explore, taste, and learn about the importance of eating fruits and vegetables. It links the classroom, cafeteria, home, and community to motivate and support students to make healthy food choices and be physically active every day.

Exploring California Pears: Taste Testing

What You Will Need:
- Variety of red, yellow, green, and brown pears, whole and quartered* (refer to Home Grown Facts on page 3 for varieties)
- One pear variety per every four students
- Whiteboard or chalkboard
- Dry erase markers or chalk

*To reduce browning (oxidation), cut pears immediately before tasting.

Activity:
- Divide students into four groups (red, yellow, green, and brown pears).
- Make four columns on the whiteboard: red, yellow, green, and brown.
- Each group observes, smells, feels, and tastes their assigned pear.
- Note the different features in the columns on the whiteboard.
- Use descriptive sensory words like sweet, fragrant, yellow, grainy, crunchy, etc.
- Discuss the similarities and differences in the four groups.
- Sample the other colors.

For more ideas, ask your school nutrition staff or ask to borrow: Fruits and Vegetables Galore, USDA, 2004.

Cooking in Class: Party Pear Frisbee

Makes 36 tastes at 2 rice cakes with yogurt each

Ingredients:
- 1 (29-ounce) can pear chunks in light syrup, drained
- 4 (6-ounce) containers lowfat vanilla yogurt
- 3½ ounces mini rice cakes

1. Spoon yogurt into a large bowl.
2. Add pears and gently stir until just blended.
3. Place 1 teaspoon of yogurt and 2 pear chunks on top of each rice cake.
4. Place 2 rice cakes in a paper tray.
5. Serve immediately.

Nutrition information per serving:
- Calories 33
- Calories from Fat 0
- Total Fat 0g
- Saturated Fat 0g
- Cholesterol 0mg
- Sodium 1mg
- Total Carbohydrate 7g
- Dietary Fiber 2g
- Sugars 7g
- Protein 0g
- Vitamin A 1%
- Calcium 1%
- Vitamin C 5%
- Iron 1%

Adapted from: Tasting Trio Team, Network for a Healthy California, 2010.

For more ideas, reference: Kids Cook Farm-Fresh Food, CDE, 2002.

Reasons to Eat Pears
- A ½ cup of sliced pears contains fiber and vitamin C.
- The edible skin* of pears is an additional source of fiber**.
- Pears offer a natural, quick source of energy, due largely to high amounts of two kinds of monosaccharides (fructose and glucose) and levulose.

*Always wash fruits and vegetables before serving.
**Learn more about fiber on page 2.

Champion Sources of Fiber*:
- Beans
- Berries
- Dates
- Peas
- Pumpkins
- Whole wheat cereals and breads

*Champion sources provide a good or excellent source of fiber.

For more information, visit: www.fruitsandveggiesmatter.gov/month/pear.html
www.nal.usda.gov/fnic/foodcomp/search/(NDB No: 09252)
What is Fiber?
- Fiber is a complex carbohydrate found only in plant foods like fruits, vegetables, grains, nuts, and seeds.
- Fiber contains no calories.
- Fiber comes in two forms: insoluble and soluble.
- Insoluble fiber is known as “roughage” and helps move food through the body to prevent constipation. It also helps control blood sugar levels.
- Soluble fiber helps pull cholesterol out of the body. It also helps control blood sugar levels and keep food in the stomach longer so that you feel full.
- Fiber may help lower the risk of high blood pressure, heart disease, stroke, and some types of cancer.

For more information, visit: www.eatright.org

How Do Pears Grow?
Pears need a location with good air circulation where the ground is slightly elevated and sloping because the trees bloom early and the flowers may be damaged in the spring by frosty air, which settles in low-lying areas. Pears should be grown in heavier soil types and will not survive on ground that is saturated with water.

The pear tree has glossy leaves and white flowers grouped in corymbs, which are pollinated to become the edible fruit. In early spring, bees help the pear trees pollinate from flower to flower on the different pear trees. During the growing season, pear orchards need the ideal warm days and cool nights that are found in California, Oregon, and Washington regions.

Pears do not ripen properly on the tree so growers pick the fruit when it is mature but green. Pears are harvested by hand, placed into bins, and transported to a packing house. The pears are graded for quality, sorted by size, and packed for the fresh market or sent to a processing facility. They are cooled to slow down the ripening process. To initiate ripening, pears need to be brought to room temperature.

For more information, visit: www.calpear.com

Botanical Facts
Pronunciation: pâr
Spanish name: pera
Family: Rosaceae
Genus: Pyrus
Species: P. communis, P. pyrifolia

Pear is the name for the fruit tree of the genus Malus and for its fruit, a pome, which is edible in most species. There are 30 known species of pears, three of which are important for edible fruit production. The common pear, Pyrus communis or European Pear, is cultivated mainly in Europe and North America, while Pyrus pyrifolia is grown mainly in eastern Asia and is known as the Nashi, Asian, or Apple Pear. The Ya Pear, Pyrus bretschneideri, is also cultivated in Asia.

Other pear species are used as rootstocks for European and Asian pear trees and as ornamental trees. For example, the Bradford Pear (Pyrus calleryana) and Willow-leafed Pear (Pyrus salicifolia) are grown only for decoration and have become widespread in North America.

Just the Facts
- There are more than 3,000 varieties of pears worldwide.
- Ninety-eight percent of all pears grown in the United States are grown in California, Oregon, and Washington.
- The Bartlett pear variety is America’s favorite pear.
- Pears ripen better off the tree and from the inside out.
- Pears are best when eaten with the peel, as that is where most of the fiber and antioxidants are found.
- Pears are processed into canned pears, fruit cocktail, juice concentrate, baby food products, and can be dried.
- The wood of pear trees is one of the preferred materials in the manufacture of high quality woodwind instruments.

How Much Do I Need?
A ½ cup of sliced pears is about one cupped handful. This is about half of one medium-sized pear. The amount of fruits and vegetables each person needs depends on age, gender, and physical activity level.

Visit www.mypyramid.gov and have students determine how many cups each of fruits and vegetables they need to eat every day. Have students write down their goals and make a daily log for tracking how many fruits and vegetables they eat each day.

Recommended Daily Amount of Fruits and Vegetables*

<table>
<thead>
<tr>
<th></th>
<th>Kids, Ages 5-12</th>
<th>Teens and Adults, Ages 13 and up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>2½ - 5 cups per day</td>
<td>4½ - 6½ cups per day</td>
</tr>
<tr>
<td>Females</td>
<td>2½ - 5 cups per day</td>
<td>3½ - 5 cups per day</td>
</tr>
</tbody>
</table>

*If you are active, eat the higher number of cups per day. Visit www.mypyramid.gov to learn more.
Student Sleuths

1. Define the following terms and describe what they do in the body: monosaccharides, fructose, glucose, and levulose.

2. Which fruits are eaten with the peel? Which fruits are typically eaten after being peeled? How much fiber is added by eating the peel of fruits like pears, peaches, and apples?

3. Make a list of the snacks you eat regularly. Analyze the sugar and nutrient content of your snacks. How healthy are your snacks? Make a list of snacks that you can eat that are healthier (more nutrients and low in sugar).

4. Research and describe the technique called grafting that is used to grow and cultivate pears. What other fruits use the grafting technique?

5. Label the parts of the pear.

6. Map the various geographical regions in California where pears are grown. What are the top three pear-producing counties in California?

For information, visit:
www.calpear.com
www.fruitsandveggiesmatter.gov/month/asian_pear.html
www.cfaitc.org/factsheets/pdf/Pears.pdf
www.usapears.com

Cafeteria Connections

- Set aside a time each day to discuss the menu with students. Ask which meals they would like to try. How many times is the featured produce included on the menu? Does each meal include a fruit and a vegetable?
- Team up with the school nutrition staff to celebrate National School Lunch Week (NSLW) during the second week of October. NSLW encourages hunger awareness and community involvement, and opens the doors for further nutrition learning and discussions. Take this opportunity to involve your classroom in a particular NSLW activity.
- Visit www.schoolnutrition.org or contact your school nutrition staff for more NSLW information.

For more information, visit:
www.ciwmb.ca.gov/schools

School Garden: Composting

Autumn is an excellent time to make a compost pile in your school garden by recycling waste from the garden and cafeteria. Composting is a simple way to add nutrients to depleted soil. Common items used in compost piles include dead bugs, twigs, leaves, hay, fruit and vegetable scraps, and coffee grounds.

Discussion:
Nutrient-rich soil helps plants grow optimally. People also need nutrient-rich foods to grow and stay healthy. Discuss with students nutrient-rich foods that grow in the garden and why it is important to eat these foods every day.

For more information on composting, visit:
www.lifelab.org
www.foodlandpeople.org
www.compostingcouncil.org

A Slice of Pear History

- Pears date back to ancient times as one of the earliest cultivated fruit trees. The Romans used special grafting techniques to develop more than 50 varieties of pears, which were introduced to other parts of Europe with the rise of the Roman Empire.
- The Bartlett pear was developed in England in the 17th century by a schoolmaster named John Stair. He sold some cuttings from a pear tree (which are used for grafting, a technique for developing new trees and fruit varieties) to a horticulturist named Williams, who further developed the variety and renamed it after himself.
- Early Americans brought pear seedlings across the Atlantic to the Massachusetts Bay Colony. In 1812, nurseryman Enoch Bartlett discovered the pear variety and, unaware of the pear’s true name, distributed it as a “Bartlett.” However, it is still known as the “Williams” pear around the world. Bartlett cuttings eventually came west when the forty-niners headed for the great California Gold Rush and they continue to grow in California today.

Student Advocates

- Have students work with school nutrition staff to design posters with pear drawings and facts to hang throughout the school and cafeteria. Partner with a local grocery store to hang students’ posters at the checkout stands.
- Help students organize a composting crew with your school nutrition staff to help reduce waste from the cafeteria. See the School Garden activity for details.

For more ideas, visit:
www.schoolnutrition.org

For more information on composting, visit:
www.lifelab.org
www.foodlandpeople.org
www.compostingcouncil.org
Adventurous Activities

Field Trip:
Take students on a pear-picking field trip or to a farmers’ market. Or bring the field trip to the school. For information on Farm to School programs, visit www.cafarmersmarkets.com.

Guest Speaker:
Ask a local pear farmer or horticulturist to hold a hands-on grafting demonstration or explain how they harvest pears.

Problem Solving:
Use pears in math equations, such as addition, subtraction, and fractions, or introduce pie charts and chart the different ways and corresponding percentages that pears are sold.

- **Example:** Sixty-five percent of pears go to canneries, 25 percent are sold fresh, 10 percent go to baby foods, etc.

Science Investigation:
- **Materials:** Unripe pears of each variety being tested, thermometers, resealable plastic bags, and supplies as determined by students.
- **Activity:**
  1. Explain that pears ripen best after they have been picked. Brainstorm variables that may affect the ripening rate.
  2. Create and perform experiments that will test each variable. For example, separate pears in plastic bags. Place one bag in the refrigerator and one on a countertop. Over the next few days, record temperatures and changes in color, firmness, etc. Compare the ripeness of the two sets of fruit.
  3. Discuss the results of each of the performed experiments.

Adapted from: www.cfaitc.org/factsheets/pdf/Pears.pdf

Calendar Connection:
Participate in Walk to School Week. Encourage students to walk with a friend or an adult to school every day. Visit www.cawalktoschool.com for details.

For more ideas, visit:
www.nass.usda.gov/Education_and_Outreach/NASS_Kids
www.ars.usda.gov/is/kids

Physical Activity Corner

Eating healthy is only one step toward fighting overweight in youth. Children should engage in at least 60 minutes of physical activity every day to stay healthy and fit, both mentally and physically.

**Objective:**
Develops strength, locomotor skills, and group cooperation

**Activity:**
- Have students pretend that they are their favorite superhero (or cartoon character) and act out a movement of the character for all the students to do together for about 30 seconds.
- As students act out their movements, have them call out their favorite fruit or vegetable that gives them energy.
- Repeat until all students have had a turn being a superhero.

**Bring It Home:**
Encourage students to talk with family members about their favorite superhero and the importance of being active every day.

For more ideas, visit:
www.sparkpe.org

Home Grown Facts

- The California pear harvest begins in mid-July and continues through September.
- Seventy-five percent of California’s pear acreage is for the Bartlett pear.
- California ranks first in Bartlett pear production, producing 60 percent of the nation’s Bartlett crop.
- California ranks second in all pear production, producing 32 percent of all pears grown in the United States.
- Other California varieties include Bosc, Seckel, Comice, and Red Anjou.

Literature Links

- Ask school librarian to promote books about fruits, like pears, to students. For a list of book ideas, visit www.harvestofthemonth.com.
- Invite librarian to classroom to read a book about nutrition or the cycles of a fruit tree.

For book lists, visit:
www.californiahealthykids.org
Pears

Primary

- *Mr. Putter & Tabby Pick the Pears* by Cynthia Rylant (Sandpiper, 1995)
- *Too Many Pears* by Jackie French and Bruce Wheatly (Star Bright Books, 2003)

Secondary

- *Pears On A Willow Tree* by Leslie Pietrzyk (Harper Perennial, 1999)

Please note that *Harvest of the Month* book lists are a compilation of books recommended by our partners, including the California Department of Education, California Foundation for Agriculture in the Classroom, and local agencies. These books are neither endorsed nor reviewed by the Network for a Healthy California.

If you wish to purchase one of these books with Network/USDA funds, please check with your Network Program Manager first.

Updated: September 2011
Pears

Source: www.usapear.com
Pears

Nutrition Facts

Serving Size: ½ cup pears, sliced (70g)

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<tr>
<th>Nutrient</th>
<th>Value</th>
<th>% Daily Value</th>
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</thead>
<tbody>
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<td></td>
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<tr>
<td>Calories from Fat</td>
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<td></td>
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<tr>
<td>Total Fat</td>
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<td>0%</td>
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<tr>
<td>Saturated Fat</td>
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<td>0%</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>0g</td>
<td></td>
</tr>
<tr>
<td>Cholesterol</td>
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<tr>
<td>Sodium</td>
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<td>Total Carbohydrate</td>
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<tr>
<td>Dietary Fiber</td>
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<tr>
<td>Sugars</td>
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<tr>
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</tr>
<tr>
<td>Vitamin A</td>
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<tr>
<td>Calcium</td>
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<tr>
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<tr>
<td>Iron</td>
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</tr>
</tbody>
</table>

Source: [www.nal.usda.gov/fnic/foodcomp/search/]
NDB No: 09252

This material was funded by USDA's Food Stamp Program through the California Department of Public Health's Network for a Healthy California. These institutions are equal opportunity providers and employers. The Food Stamp Program provides nutrition assistance to people with low income. It can help buy nutritious foods for a better diet. For information on the Food Stamp Program, call 1-888-328-3483.

© California Department of Public Health 2008.
Pear
Rosaceae Pyrus communis
(analysis based on unpeeled raw Bartlett pear)
Pictured from top: yellow Bartlett, red Bartlett, Bosc, Anjou pears
Lesson Part Two: Root Vegetables
The following activities are from Harvest of the Month: Root Vegetables.

A. Page 2: Find fresh examples (as a second resort, find pictures) of the root vegetables in the chart under “Botanical Facts”. Then use the following steps to learn about root vegetables.
   1.) Read “Botanical Facts” and start a similar chart where everyone can see it. Using your samples, look at the characteristics of each of the subgroups to see if you can visually see the differences between the subgroups. You may want to wash and taste each of the crops.

   2.) Discuss the root vegetables you grew in the garden. Did you start with seeds, seed pieces, small plants or bulbs? How deep did you plant them? How long did it take for them to produce the vegetable that you ate? How did you harvest them? How many root vegetables grew from one plant? Then read “How Do Root Vegetables Grow” and display the Tuber Plant diagram if possible.

B. Page 1: Read the “Reasons to Eat Root Vegetables” then proceed with the following steps to make “Jicama Cucumber Salad”. Be sure to buy an extra jicama to cut into small samples and taste raw.

   1.) Jicama (the “j” is pronounced with an “h” sound) is a root vegetable that is not commercially grown anywhere in the United States. Does the label on the jicama say where it was from? According to the “Root Vegetable History” on page 3, the Spanish introduced jicama to the Philippines and Malaysia in the 1600s. Why don’t we grow jicama in the United States? (Find the answer on the Internet.) Talk about other fruits and vegetables found in our grocery store produce aisles that are probably not grown commercially in the United States. Challenge the students to look at the labels the next time they go to the grocery store.

   2.) The recipe also contains cucumbers. Did you grow cucumbers in your garden? Cucumbers are not a root crop; have the students describe how the cucumbers grew. Discuss what kind of a plant limes grow on and whether they grow near where you live. Ask what vegetable chili powder comes from (chili peppers) and if you planted any peppers.

   3.) Look at the ingredient list and talk about the combination of sweet, sour, and spicy flavors from the one fruit and three vegetable ingredients. Talk about other foods that combine similar flavors such as salsa. You may want to read the labels on sauces, dips, entrees, etc. to find similar combinations of sweet, sour, and spicy fruit and vegetable ingredients.

   4.) Assign students tasks to make the salad. Under running water, wash hands and then the jicama, cucumber, and lime. You can use plastic knives and plastic plates to cut the ingredients. Demonstrate how to hold the produce to keep fingers away from the knife blade and always cut with the knife blade down and going away from you. Have an adult cut the jicama into smaller, more manageable chunks, to make it safer for the students to peel and cut into smaller chunks.
C. Page 4, “Physical Activity Corner”

We can enjoy the sunshine, air and life above the ground and we can move around. Root vegetables live and grow in one underground spot their entire life. Celebrate being a person instead of a root vegetable by figuring out how you can form a “walking school bus” and take some younger children for a walk outside.
Exploring California Root Vegetables: Taste Testing

Getting Started:
- Partner with your school nutrition staff, local farmers’ market, or grocery store to obtain produce for taste tests.

What You Will Need (per group):
- ½ cup each of raw, peeled, and sliced jicama and turnips
- ½ cup each of cooked* and sliced russet potatoes and rutabagas
- Printed Nutrition Facts labels for jicama, turnips, potatoes, and rutabagas**

Activity:
- Record sensory impressions by creating a Venn diagram on the board.
- Taste vegetables and note the look, texture, smell, color, and taste.
- Ask students to write a reflection or thank you letter to the farmer or school nutrition staff. Include sensory descriptions or reasons why they liked or disliked certain items.
- Examine Nutrition Facts labels for all items. Discuss how they differ nutritionally.
- Refer to Botanical Facts (page 2) and explain how tubers differ from roots.

*Make arrangements to cook (steam) potatoes and rutabagas in advance.
**Download from the Educators’ Corner of www.harvestofthemonth.com.

For more ideas, reference: Kids Cook Farm-Fresh Food, California Department of Education, 2002.

Nutrition Facts

Serving Size: ½ cup raw jicama, sliced (60g)
Calories 23
Calories from Fat 0
Total Fat 0g 0%
Saturated Fat 0g 0%
Trans Fat 0g
Cholesterol 0mg 0%
Sodium 2mg 0%
Total Carbohydrate 5g 2%
Dietary Fiber 3g 12%
Sugars 1g
Protein 0g

Vitamin A 0%  Calcium 1%
Vitamin C 20%  Iron 2%

Cooking in Class: Jicama Cucumber Salad

Ingredients:
Makes 24 tastes at ¼ cup each
- 1 pound jicama, peeled and cut into ½-inch cubes
- 2 medium cucumbers, quartered, and sliced ¼-inch thick
- 1 fresh lime
- 3 teaspoons chili powder
- Small plates and forks

1. Combine jicama and cucumbers in a large bowl.
2. Squeeze lime juice over salad and mix well.

For nutrition information, visit: www.harvestofthemonth.com.

Reasons to Eat Root Vegetables

- A ½ cup of most root vegetables provides an excellent source of vitamin C.
- A ½ cup of sliced jicama is a good source of fiber.
- Complex carbohydrates* (commonly referred to as “starches”) are a key nutrient in root vegetables.

*Learn about complex carbohydrates on page 2.

Champion Sources of Complex Carbohydrates*
- Corn
- Dry beans
- Peas
- Sweet potatoes

*Champion foods include those in which most of their calories come from complex carbohydrates.

Source: USDA Nutrient Database
What Are Complex Carbohydrates?

- “Starchy vegetables” provide calories in the form of complex carbohydrates. They also provide vitamins, minerals, and fiber.
- The primary function of carbohydrates is to provide energy for the body, especially the brain and nervous system.
- Most people should get 55-60%, or over half, of their total calories from carbohydrates, preferably starches and naturally occurring sugars.
- Complex carbohydrates are made of polysaccharides (long chains of sugar units) that come from plant-based foods.
- The body uses enzymes to break down complex carbohydrates like starch into glucose, which the body then uses for energy.
- In plants, starch is produced by photosynthesis. Tubers store the highest quantities of starch of all vegetables.


For more information, visit: www.fruitsandveggiesmatter.gov

How Much Do I Need?

A ½ cup of sliced root vegetables is about one cupped handful. Root vegetables come in a variety of colors and most can be eaten raw or cooked. The amount of fruits and vegetables you need depends on your age, gender, and physical activity level. Remind students to eat a variety of colorful fruits and vegetables throughout the day. It will help them reach their recommended daily amounts.

Recommended Daily Amounts of Fruits and Vegetables*

<table>
<thead>
<tr>
<th></th>
<th>Kids, Ages 5-12</th>
<th>Teens and Adults, Ages 13 and up</th>
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<tr>
<td>Females</td>
<td>2½ - 5 cups per day</td>
<td>3½ - 5 cups per day</td>
</tr>
</tbody>
</table>

*If you are active, eat the higher number of cups per day. Visit www.choosemyplate.gov to learn more.

How Do Root Vegetables Grow?

Root vegetables are cool-weather crops. Roots such as beets, carrots, radishes, rutabagas, and turnips can be planted in early spring and late summer for two crops. Tubers are a single-crop vegetable that can take up to one year to harvest. Roots need to be thinned so they have enough room to develop properly. Tubers do not require thinning, but they do need plenty of space and soil covering the underground vegetables.


For more information, visit:
www.ncsu.edu/sustainable/profiles/pppotato.html
www.urbanext.illinois.edu/veggies/potato1.html

Botanical Facts

Root vegetables are the roots of plants that are eaten as vegetables. These roots grow into the ground from the base of the plant stem. They anchor the plant, absorb water and nutrients, and store energy. Root vegetables are divided into six subgroups: Tap Roots, Tuberous Roots, Corms, Rhizomes, Tubers, and Bulbs.

Tubers differ from other roots in that they are swollen underground stems, capable of producing new plants and storing energy for the parent plant. If the parent plant dies, the underground tubers can create new plants. Other roots can take nutrients from the ground, but cannot store energy or use it for reproduction. So while every tuber is a root vegetable, not all roots are tubers.*

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>Varieties</th>
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</thead>
<tbody>
<tr>
<td>Tubers</td>
<td>Potato, sunchoke, yam</td>
</tr>
<tr>
<td>Tap Roots</td>
<td>Beet, carrot, cassava, jicama, parsnip, radish, rutabaga, turnip</td>
</tr>
<tr>
<td>Tuberous Roots</td>
<td>Sweet potato, yucca</td>
</tr>
<tr>
<td>Corms</td>
<td>Celeriac, eddo, taro, water chestnut</td>
</tr>
<tr>
<td>Rhizomes</td>
<td>Arrowroot, galangal, ginger, ginseng, lotus root, turmeric</td>
</tr>
<tr>
<td>Bulbs</td>
<td>Garlic, onion, shallot</td>
</tr>
</tbody>
</table>

*Refer to Carrots, Potatoes, and Sweet Potatoes newsletters for more information about root vegetable varieties.

For more information, visit:
http://aggie-horticulture.tamu.edu/extension/specialty

Tuber Plant

Adapted from: Buried Treasure: Roots & Tubers by Meredith Sayles Hughes, 1998. To download reproducible botanical images, visit the Educators’ Corner at www.harvestofthemonth.com.
School Garden: To Dig or Not to Dig?

If your school has a garden, here is an activity you may want to implement. Look for donations to cover the cost of seeds, tools, irrigation systems, electric pumps, and any salary incurred by garden educators or others.

Demonstrate the importance of planting in loosened soil. In compacted or dense soil, there is less room for air, making it difficult for water to drain.

Materials:
- 20 root seeds of same variety (e.g., turnips, parsnips)
- 4’ x 8’ unprepared garden area (i.e., soil is hard)
- String
- Markers
- Spading forks

Student Activity:
- Divide garden area in half using string.
- Label one side “Bed A.” Use forks to loosen soil to six inches deep.
- Label the other side “Bed B.” Leave it untouched.
- Plant equal number of seeds in Beds A and B. Record predictions about growth and harvesting in a journal.
- Harvest mature plants and taste the edible parts.
- Write an analysis of which bed was more suitable for plant growth and why. Compare it to original predictions.

Complete Student Sleuths #5.


Student Champions
- Form a Nutrition Advisory Council to promote nutrition and school meals to student peers.
- Collaborate with school nutrition staff to create a taste testing event, make seasonal produce suggestions, or develop a standardized menu that complies with USDA school meal nutrition guidelines.

For more information, visit:
www.calsna.org/NAC/NAC.asp
www.fns.usda.gov/cnd/menu/menu_planning.doc

Home Grown Facts
- Jicama is not commercially grown anywhere in the United States.
- California leads the nation in production of Daikon radishes.
- Turnips are produced mainly as a small (approximately 400 acres) commercial crop in Kern and Imperial counties.
- In California, parsnips are grown mainly in home gardens.

Source: www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1_Chapter_1_State_Level/California/st06_1_034_034.pdf

Student Activity:
California imports produce from other states or countries. Locally grown foods, especially fruits and vegetables, are likely to be fresher and taste better than foods shipped from out-of-state.
- At your local market, ask the produce manager where the store buys its produce.

For more information, visit:
www.cdfa.ca.gov

Student Sleuths
1 Complex carbohydrates, like those found in starch, provide the body with longer releasing energy. How does this differ from the energy provided by simple carbohydrates?
2 What is a root? What is a tuber? List examples of each.
3 Sweet potatoes (a root) are a good source of potassium. (USDA defines a “good source” as supplying at least 10% daily value of a nutrient per serving.) List three other fruits or vegetables that are good sources of potassium.
4 What is the difference between annual and perennial plants?
5 How do soils become compacted? What happens when the soil becomes compacted? How can we avoid compacting our garden beds?

For information, visit:
www.fruitsandveggiesmatter.gov
www.nal.usda.gov/fnic/foodcomp/search
www.extension.umn.edu/distribution/cropsystems/components/3115s01.html
www.garden.org

A Slice of Root Vegetable History
- Root vegetables were an essential part of the diet during the early evolution of humankind (about five million years ago).
- Turnip fossils were found in caves in China dating back thousands of years.
- Jicama was brought to the Philippines and Malaysia by the Spanish in the 1600s.
- Rutabagas are believed to have originated in Bohemia in the 1700s as a cross between the turnip and wild cabbage.
- American colonists relied heavily on root vegetables because they could be stored for months in the harsh New England winters.

For more information, visit:
www.idph.state.ia.us/pickabettersnack/common/pdf/factsheets/potatoes.pdf
www.ba.ars.usda.gov/hb66/078jicama.pdf
**Adventurous Activities**

**Math Analysis**

Compare and contrast the content of predominant nutrients – including vitamins and minerals – in different root vegetable varieties (e.g., jicama, parsnips, rutabagas, turnips, yams, sweet potatoes, potatoes).

**Helpful Hint:**
Complete in conjunction with Taste Testing activity on page 1.

For information, visit:
www.nal.usda.gov/fnic/foodcomp/search

**Cafeteria Connections**

- Examine the school lunch menu. List the different choices of root vegetables. Have students design posters promoting the nutritional significance of a root vegetable of their choice. Display posters in cafeteria.
- Ask students to select which root vegetables they will try. Record feedback and submit summary to the school nutrition staff with recommendations.
- Promote lunch time as a way for students to obtain maximum nutrition and help meet their daily fruit and vegetable needs. Design promotional messages around fruits and vegetables served that week.

For more ideas, visit:
www.schoolnutrition.org

**Just the Facts**

- Only the roots of jicama plants are edible.
- Turnips are members of the mustard family.
- The name rutabaga comes from the Swedish word rotsagga, meaning “thick root.”
- The word Daikon comes from two Asian words: dai- (large) and kon (root).

For more information, visit:
www.uga.edu/rootandtubercrops
www.panen.psu.edu/s.n.a.c

**Literature Links**

- Research the history of turnips and rutabagas in Irish, Scandinavian, and Russian cultures.
- Talk with a local dietitian to identify valid resources for nutrition information. Discuss popular beliefs about carbohydrates and resolve myths and facts.
- If allowed, conduct a taste test in a school library. Have the librarian present literature, such as a book related to food and/or nutrition.

For a list of book ideas, visit:
www.harvestofthemonth.com

**Physical Activity Corner**

Form a “walking school bus” to promote physical activity. For ideas on how to start a walking school bus, visit www.walkingschoolbus.org. A healthy lifestyle consists not only of a healthy overall diet, but also plenty of physical activity. The recommended amount of physical activity for children is 60 minutes on most days and 30 minutes for adults.

For more information, visit:
www.cawalktoschool.com

**Activities & Resources Galore**

Visit the Educators’ Corner online for more resources:
- Cooking in Class (recipe analyses, cooking tips)
- Reasons to Eat (Nutrition Glossary)
- How Does It Grow (botanical images, growing tips)
- Student Sleuths (Answer Key)
- Adventurous Activities
- Literature Links (book lists)
- Links to California Content Standards (all grades)

Root Vegetables

Primary

- *Blue Potatoes, Orange Tomatoes* by Rosalind Creasy (Sierra Club Books for Children, 1997)
- *The Life Cycle of a Carrot* by Linda Tagliaferro (Capstone Press, 2007)
- *Tops and Bottoms* by Janet Stevens (Harcourt Brace and Company, 1995)
- *The Vegetables We Eat* by Gail Gibbons (Holiday House, 2007)

Secondary

- *Blue Potatoes, Orange Tomatoes* by Rosalind Creasy (Sierra Club Books for Children, 1997)
- *Food in Colonial and Federal America* by Susan Oliver (Greenwood Press, 2005)
- *Food in the United States, 1820’s – 1890* by Susan Williams (Greenwood Press, 2006)

Please note that *Harvest of the Month* book lists are a compilation of books recommended by our partners, including the California Department of Education, California Foundation for Agriculture in the Classroom, and local agencies. These books are neither endorsed nor reviewed by the *Network for a Healthy California*.

If you wish to purchase one of these books with *Network/USDA* funds, please check with your *Network* Program Manager first.

Updated: September 2011
Root Vegetables

Adapted from: *Buried Treasure: Roots & Tubers* by Meredith Sayles Hughes, 1998.
How Do Root Vegetables Grow?

Roots and tubers are cool-weather vegetables. Root vegetables such as beets, carrots, radishes, rutabagas, and turnips can be planted in the early spring and late summer for two crops. Tubers are a single crop vegetable that can take up to a year to harvest. Root vegetables need to be thinned so they have enough room to develop properly. Tubers do not require thinning, but they do require space and plenty of soil covering the underground vegetables.

Soil, climate, and other conditions can affect the amount of capsaicin in a pepper, so that peppers of the same variety – even on the same plant – can vary in hotness. Habanero peppers contain the highest concentration of capsaicinoid and are the hottest pepper variety.

<table>
<thead>
<tr>
<th></th>
<th>ROOTS</th>
<th>TUBERS</th>
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<tbody>
<tr>
<td><strong>Climate/Growing Temperature</strong></td>
<td>50-65 degrees F</td>
<td>60-70 degrees F</td>
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<tr>
<td><strong>Soil Type and pH level</strong></td>
<td>Loamy and well aerated; pH level between 5.5-6.8</td>
<td>Deep, sandy and well draining; pH level between 5.5-6.2</td>
</tr>
<tr>
<td><strong>Irrigation</strong></td>
<td>Requires regular watering</td>
<td>Requires regular watering</td>
</tr>
<tr>
<td><strong>Planting</strong></td>
<td>Annual crop requires direct seeding</td>
<td>Perennial crop started from slips or eyes of the produce</td>
</tr>
</tbody>
</table>

For more information, visit:

- [www.ncsu.edu/sustainable/profiles/pppotato.html](http://www.ncsu.edu/sustainable/profiles/pppotato.html)
- [http://urbanext.illinois.edu/veggies/potato1.html](http://urbanext.illinois.edu/veggies/potato1.html)
## Jicama Nutrition Facts

**Serving Size:** ½ cup jicama, sliced (60g)

<table>
<thead>
<tr>
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</tr>
<tr>
<td>Trans Fat</td>
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<td>Vitamin C</td>
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<td>Iron</td>
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NDB No: 11603
## Nutrition Facts

Serving Size: ½ small russet potato, baked with skin (69g)

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<tr>
<td>Iron</td>
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</table>

Other nutrients: Vitamin B6 (27%), Potassium (24%), Magnesium (11%), Folate (10%), Niacin (10%), Thiamin (7%)

NDB No: 11356
Rutabagas

Nutrition Facts

Serving Size: ½ cup cooked rutabagas, cubed (85g)

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</tr>
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<td>Saturated Fat 0g</td>
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<td>0%</td>
</tr>
<tr>
<td>Trans Fat 0g</td>
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<td></td>
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<tr>
<td>Cholesterol 0mg</td>
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<tr>
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<td>Protein 1g</td>
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<td>Vitamin C 27%</td>
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<td>Iron 3%</td>
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</table>

Other nutrients: Potassium (8%), Magnesium (5%)

Source: www.nal.usda.gov/fnic/foodcomp/search/
NDB No: 11436
Turnips

Nutrition Facts

Serving Size: ½ cup raw turnips, cubed (65g)

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<tbody>
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<tr>
<td>Sodium 44mg</td>
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<tr>
<td>Total Carbohydrate 4g</td>
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<td>Dietary Fiber 1g</td>
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<td>Sugars 2g</td>
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<tr>
<td>Protein 1g</td>
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</tr>
<tr>
<td>Vitamin A 0%</td>
<td>Calcium 2%</td>
</tr>
<tr>
<td>Vitamin C 23%</td>
<td>Iron 1%</td>
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</tbody>
</table>

Source: www.nal.usda.gov/fnic/foodcomp/search/
NDB No: 11564
Potato

Solanaceae *Solanum tuberosum*

(analysis based on *unpeeled, microwave-baked potato—with skin eaten*)

Pictured from top: round red, russet, long white, round red, small round white, russet, red creamer potatoes

---

**Serving Size**

1 Medium Potato
200 Grams

210 Calories

▲ from fat

6% from protein

93% from carbohydrate

5 Grams Protein

48 Grams Carbohydrate

5 grams dietary fiber

0.2 Gram Fat

144 Grams Water

16 Milligrams Sodium

▲ Trace
Lesson Four: How do you make your plate look like MyPlate?

For December

“Choosing from the Food Groups” and “Making Healthy Food Choices” from EATING FROM THE GARDEN, University of Missouri Extension

Students taste kohlrabi and beets, and learn about healthy food choices through MyPlate, food groups, and portion sizes. They find out which nutrients come from which food group and how much they need to eat. Student learn to recognize how much they are eating.

Content objectives: Understand how to choose from the food groups to make a healthy meal; identify how sugar and fat should affect our food choices; identify nutrients in each food group; describe the amount of food from each food group they need each day; recognize how much food they are eating.

Life Skill objectives: Healthy lifestyle choices, Critical thinking, Communication, Cooperation, Decision making, Problem solving,

Core and STEM concepts and skills:
Science
Math
Language Arts
Social Studies
Healthy snack: Raw Kohlrabi, Sautéed Kohlrabi, Grated Beet Salad, MyPyramid Roll-up

Additional and supporting resources:
Go to www.choosemyplate.gov/kids for games, songs, videos and additional activities.
LESSON PLANS FOR 2012-14 SCHOOL YEAR, GRADE 5

**November/December:** How do you make your plate look like MyPlate?

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<tr>
<td>Lesson: Choosing From the Food Groups from <em>Eating from the Garden</em> University of Missouri Extension</td>
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<tr>
<td>Making Healthy Food Choices (Portions) from <em>Eating from the Garden</em> University of Missouri Extension</td>
<td>13</td>
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<tr>
<td>Handouts for the lessons</td>
<td>20</td>
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<tr>
<td>Recipe: MyPlate Roll-Up (recipe called MyPyramid Roll-Up)</td>
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</tr>
<tr>
<td>Take home assignment: Nutrition News, Family Newsletter 6, MyPlate from <em>Eating from the Garden</em>, University of Missouri Extension</td>
<td>29</td>
</tr>
<tr>
<td>Choose MyPlate blank color sheets</td>
<td>31</td>
</tr>
<tr>
<td>Choose MyPlate mini poster</td>
<td></td>
</tr>
<tr>
<td>MyPyramid for Kids mini poster</td>
<td></td>
</tr>
<tr>
<td>United States Department of Agriculture</td>
<td></td>
</tr>
</tbody>
</table>

*download separately*
BEFORE THE LESSON

1. **Grade 5, December: MyPlate**
   This document contains all the curriculum items and resources you need for this lesson. All lesson downloads are located on the [www.peoplesgarden.wsu.edu](http://www.peoplesgarden.wsu.edu) Educational Toolkit.

2. **MyPlate**, United States Department of Agriculture (USDA)
   [http://www.choosemyplate.gov/kids](http://www.choosemyplate.gov/kids)

   Please make copies (colored, if possible) of the MyPyramid and MyPlate mini posters and display them as a reference throughout the lesson. The MyPyramid for Kids poster is made for younger kids but it is good illustration of activity and the outdoors – two things we need to stay healthy. If you haven’t already done so, make a simple mini poster summarizing the four simple steps to food safety that the students will need to remember when preparing food. Refer to Fight BAC®: Four Simple Steps to Food Safety, North Dakota State University Extension from previous lessons. Upon request, or if you think they will be used at home, you may also make copies to send with the students.

3. The **Nutrition News, Family Newsletter 6, MyPlate** from Eating from the Garden, University of Missouri Extension, is a take home activity sheet to be used at the end of the lesson and incorporated into the Garden Journals or Records. Make one double-sided copy per student.

4. **Recipe: MyPlate Roll-Up (recipe says MyPyramid)**
   Project or display one copy of the recipe for everyone to see. Collect the supplies and ingredients. If possible, wash and prepare some of the ingredients ahead of time. Keep ingredients in a cooler until they are ready to use. An alternate recipe of Sautéed Kohlrabi is included.

5. There are other handouts from the lessons that should be prepared before doing the lessons.


THE LESSONS

Please note that there are some references to MyPyramid and MyPlate. There was a transition from the MyPyramid to the MyPlate during the school years for the HGHY project; not all lesson documents have been updated.

1. **Part One: Choosing From the Food Groups** is a lesson that starts in the classroom, goes home, and comes back. There are several gardening activities that you will not be able to do during the winter months. You may want to try them at the appropriate time. For this lesson, here are the classroom activities that we recommend.

   A. Start with the Core activity: Choosing From the Food Groups on the lower half of the second page and continue through the Closing comments. You may want to make and eat the MyPlate Roll Up and come back to the review questions.
B. Skip the Gardening Activities. You may want to refer to them at the appropriate time.
C. Make and eat the MyPlate Roll Up (recipe says MyPyramid Roll-Up). Plan the best way to prepare the ingredients and supplies before class. Then think about the best way to organize the students and the recipe to make assembly go as cleanly and efficiently as possible.
D. Make one backed copy per student of Nutrition News, Eating From the Garden, Family Newsletter 6 and distribute it to the students. Review the first page and talk about the serving sizes on the second page. Read the Family activity and send the activity sheet home with the students to do with their families. Give them a week to record three days of fruit and vegetable consumption by their family members, then have them return the completed sheet. You may have to offer an incentive such as extra free time, stickers, more snacks, etc. if they return the completed sheets. After discussing what they found, have the students add the sheets to their Garden Journal.

2. Part Two: Making Healthy Food Choices is a lesson that focuses on portion control. There are several garden activities that you will not be able to do (such as putting the garden to bed).
   A. Start with the Core activity: Portion-size Activity
   B. Skip the Gardening Activities. You may want to refer to them at the appropriate time.
   C. Complete the Core Activity: Vegetable Tasting (beets).
   D. Consider optional activities as they fit your class schedule.

AFTER THE LESSON
Challenge the students to use what they learned about MyPlate at home. Check in once in a while to see what they did.
Choosing From the Food Groups

Note: If vegetables were not harvested last lesson, harvest them this lesson. Do garden activities first so that vegetables can cook while you are doing the nutrition section.

Knowledge objectives:

- Students will understand how to choose from the food groups to make a healthy meal.
- Students will identify how sugar and fat should affect our food choices.
- Students will be able to identify the main nutrients each food group contributes to our bodies.

Behavioral objectives:

- Students will choose foods they would like to plant from each food group.
- Students will recognize how plants grow from a seed.

Doing the lesson:

Review of Previous Lesson (not taught in HGHY):

- Who remembers what nutrients are? Substances that our bodies need to help us grow and stay healthy.
- Who can name the six classes of nutrients that we talked about? Carbohydrates, protein, fat, minerals, vitamins and water.
- Which nutrients provide our bodies with energy? Carbohydrates, protein and fat.
- Where do we get these nutrients? We get them from different foods that come from plants and animals.

Supplies needed:

- Handouts and family newsletters
- MyPlate poster
- What’s Inside a Seed? handout (2-2)
- Cereal or other food package with MyPlate graphic on it
- Soaked bean seeds, one for each student
- Magnifying glasses
- Kohlrabi
- Knife, chopping board and napkins
- Ingredients and equipment for recipe preparation (optional)

Advance preparation:

- Photocopy handouts 5-1, 5-3 and family newsletter (one copy per person).
- Soak bean seeds.
- Gather materials and garden supplies.
- Prepare five or six stacks of food cards from food models. (Each stack has one picture from each of the five food groups. May also use seed packets for picture cards.)
- Prepare sets of food models or pictures showing a food prepared two ways – one low in fat or sugar and one high in fat or sugar.
- Prepare vegetable for tasting.
Nutrition activities:

Core activity: Vegetable tasting

1. Show students a kohlrabi.

Discussion: Kohlrabi, once the favored vegetable of European nobles and peasants alike, has fallen off the veggie pop charts. Most people don’t know what it is. Its appearance somewhat resembles a hot-air balloon. Picture the turnip-shaped globe as the passenger section, the multiple stems that sprout from all parts of its globular form as the many vertical ropes, and the deep green leaves at the top as the parachute. Kohlrabi is often mistakenly referred to as a root vegetable. It is actually a stem vegetable and grows just above ground, forming a unique, turnip-shaped swelling at the base of the stem. Kohlrabi is a member of the cabbage family. The taste and texture of kohlrabi are similar to those of a broccoli stem or a cabbage heart, but its taste is milder and sweeter. Of kohlrabi’s two varieties, the purple globe is sweeter and tastier than the apple-green. Both have a pale green, almost ivory colored flesh inside. Kohlrabi can be eaten raw or cooked.

Food tasting: Wash and remove stems by pulling or cutting them off the kohlrabi globe. Stems and leaves can be chopped and included in a tossed salad. If the kohlrabi is small, there is no need to peel it. Cut into small squares and serve to students to taste. Ask the students to describe how it feels and tastes. Is it crisp? Soft? Smooth? Crunchy? Cold? Sweet? Sour? Bitter? Tart?

Core activity: Choosing From the Food Groups

Introduction to the Food Groups (show MyPlate poster).

1. Discussion: We know that we must eat a variety of foods to get all the nutrients our bodies need to grow and stay healthy. How do we know what foods we need to eat and how much of them we need to eat? Luckily, we have the food groups to help us figure that out.

Has anyone ever seen this before? Where? (Show the students the MyPlate graphic on a food package or mini-poster.)

The food groups serve as a guide to help us choose foods that can help us be healthy. We are encouraged to eat foods from five main groups each day.

Did you notice that some of the sections are bigger than others? We should eat more foods from the vegetable and grain food groups. They are low in fat and sugar. They are also high in nutrients including fiber. All food groups are equally important. A food group’s plate section being larger than another group’s does not mean that food group is more important. It just means that we need to eat...
more from that food group to get the right amount of nutrients that our bodies need.

- We should eat more foods within each food group that are low in fat and sugar. For example, an apple (show food model of an apple) is low in fat and sugar and has lots of nutrients. When we make it into apple pie (show food model of piece of pie), we add fat and sugar. (Compare labels on back of the food models for fat and sugar.) It is okay to have pie once in a while, but we should eat more apples. Apples are good for us and fun to grow.

Let’s look at some foods in each of these food groups that are fun to plant and eat every day to keep us strong and healthy.

2. Food group classification and location activity

- Divide the students into five or six groups and give each group a stack of food cards. Give each group a copy of the blank MyPlate poster (5-4).

- Review each food group one at a time by following the procedures noted below. Have students lay their food model from each food group on the poster as discussed:

  **Discussion:** Like nutrients, foods may be divided into different groups. Using the MyPlate handout (5-1), discuss with the class why foods belong to particular groups, why we need those foods and what other foods belong to the group.

- Classification and location procedures:

  A. Read the name of the food group and a characteristic of the foods in that group. (Start with vegetables, using the information below.)

  B. Tell students that each of the food groups provides many nutrients. However, each food group is an especially good source of some nutrients. Why is that group important? Write key words on the board. This will help the students complete the Match the Food Groups (5-2) handout. Have students write the name of the food group and list the major nutrients on the MyPlate handout (5-1).

  C. Ask students if they have food cards from each of the food groups as you discuss them. Some foods are higher in fat, sugar and sodium than other foods in their respective food group. Be sure to discuss whether this food is one we should eat more often or only sometimes.

  D. Point out if the food is planted in the garden or could be grown there.

  E. Repeat the procedure with the other food groups: fruits, grains, protein and dairy.
Discussion:

**Vegetable Group**

- The Vegetable Group is shown in the bottom-left plate section.
- This group includes plant parts that are grown for food and do not contain seeds. Different parts of the plant, such as the root, stem, flower, seeds or leaves, are considered vegetables.
- The group provides vitamins, minerals and fiber that our bodies need to keep us healthy and growing. Dry beans and peas like pinto beans and black beans even provide protein. Vitamin A in vegetables from this group helps us to see better at night.
- Examples of foods in this group are carrots, spinach, beans and onions. We need to eat more fresh, canned and frozen vegetables without adding salt, butter and sauces. Avoid frying vegetables — we should eat fried vegetables and condiments less often, and we should eat fresh vegetables more often.

**Fruit Group**

- The Fruit Group is shown in the top-left plate section.
- Fruits are from plants that are grown for food, contain seeds and are usually sweet. Some foods that we think are vegetables are actually fruits (e.g., tomato, bell pepper, cucumber, squash).
- This group provides vitamins, minerals and fiber that our bodies need to keep us healthy and growing. Vitamin C in foods from this group help keep our gums and skin healthy, help us resist infections and help to heal cuts.
- Examples of foods in this group are apples, bananas, mangoes, orange juice and raisins. Eat or drink fresh, frozen or canned fruit without extra sugar or heavy syrups. Drink 100% fruit juices rather than fruit-flavored drinks.
- Half of our plate should contain fruits and vegetables.

**Grain Group**

- The Grain Group is shown in the top-right plate section.
- This group includes all foods made from any type of grain product (e.g., wheat, rice, oats; grains ground to flour).
- Grains are a good source of complex carbohydrates. Complex carbohydrates from starches take longer for our bodies to digest and keep us feeling full longer. Some provide us energy, and others, known as fiber, help to clean out our digestive tract,
allowing food to pass through the body smoothly. Grains are also a good source of protein and B-vitamins.

• Examples of foods in this group are bread, cereal, rice, pasta, tortillas and crackers. Whole-grain breads and bread products are especially high in fiber. We need to make half of our grain servings whole grain. We need to eat fewer doughnuts, sweet rolls, sugary cereals, chips and other foods high in sugar and fat.

**Protein Group**

• The Protein group is shown in the bottom-right plate section

• This group includes meat and beans. Why do you suppose it is called the “protein” group?

• This group provides our body with protein that our muscles need to grow and stay healthy. Protein also has lots of vitamins and minerals. A variety of plant and animal products are high in protein.

• Examples of foods in this group are meat, fish, poultry, eggs, beans, nuts and seeds. You can also find fat in meats, nuts and seeds, and complex carbohydrates in dry beans and peas. Eat more beans and lean meats because they are low in fat. Grill or broil meat to keep the fat down. Eat small amounts of eggs, nuts and seeds, which are higher in fat. Eat less bacon, sausage, luncheon meat, fried fish and chicken because they have more fat and sodium.

**Dairy Group**

• Where is the Dairy Group shown? Is this what your plate might look like at home?

• This group includes all food products made from milk.

• It provides the mineral calcium, among other nutrients, which our bodies need to keep our teeth and bones strong. Dairy products are also good sources of protein, B-vitamins, water and carbohydrates.

• Examples of foods in this group are milk, chocolate milk, yogurt, ice cream and cheese. Choose low-fat milk and milk products including cheese and yogurt. Eat fewer dairy products that are high in fat and sugar such as whole milk, ice cream, frozen yogurt, pudding, sour cream, cream cheese and whipped cream.

• For those of you who can’t have milk or other dairy products (because you’re lactose intolerant), plant foods such as beans, broccoli and tofu, and nuts such as almonds are good sources of calcium. You just have to eat more of these foods to get all of the nutrients that you would normally get from dairy products.
Distribute the blank food group handout (5-1) to each student. Ask students to complete their mini-poster with the names of the groups and their favorite foods in each group.

Give each student or group of students two food models of the same or similar food prepared two ways — one high in fat or sugar and one low in fat or sugar. Have the students compare the fat and sugar content on the back of the food models. Decide which group the food is in and which way of preparing it is the healthier choice. Share answers with the class.

3. Closing comments

- Discuss combination foods that fit into more than one category. How many food groups would pizza or sandwiches fit into? (Consider the individual parts of the food. What is the food made of?)

- What else do we need to do to be healthy? We need to do something active every day. What are some activities you do to stay active? Is planting and taking care of a garden a way to be active?

- Start with one new, good thing and add another every day. What is one healthy food choice or activity you will try to do?

Review:

1. What are the five food groups?
   Vegetables, fruits, grains, protein and dairy.

2. Why are whole-grain foods and fruits and vegetables good for us?
   They are high in vitamins, minerals and fiber to keep us healthy.

3. What two food groups should fill half our plate?
   Fruits and vegetables.

4. How much of our grains should be whole grains?
   Half of our grains should be whole grains.

5. When making protein and dairy choices, what should we keep in mind?
   Choose ones that are low in fat and sugar.

6. If we can’t have the plate half full of fruits and vegetables, when can we eat more of them?
   During snack time.
**Gardening activities:**

**Core activity: Seed dispersal**

**Discussion:**
1. Review What’s Inside a Seed? (2-2) and refer to it as you discuss the parts of the seed. Seeds are amazing packages of potential protected by a hard shell called a seed coat. The embryos contain a plant’s first leaves and roots. The sac around it is called the cotyledon and contains the food supply for the seed. When we eat seeds, we also get the protein, fat and carbohydrates. Where are seeds found in a plant? *In the fruit.*

2. Germination is the process by which the seed takes in water and swells, and the embryo starts to grow. We can also say that when a seed germinates, it sprouts. Have you eaten sprouts? Seeds need water, proper temperatures and oxygen to germinate. Distribute The Life of a Bean Plant (5-3) and a bean seed that has been soaking for at least 12 hours. Explain that by soaking the seed, we have made the seed easier to take apart and begin the process of germination. Ask them to carefully take apart the seed and find the seed coat, embryo and stored food area. Have them match the parts of their seed to the seed illustrated on What’s Inside a Seed? (2-2). Use handout 5-3 to explain how the embryo will continue to grow to make a bean plant, produce a flower and then produce seeds again.

**Note:** Have extra soaked beans, as some will not have an embryo to view. Magnifying glasses can be helpful here.

**Discussion:**
3. What are some reasons seeds may not germinate after they have been planted?

   - Soil temperature is too hot or too cold — some plants prefer warmer or colder temperatures.
   - Soil is too dry or too wet, so the seeds rots.
   - Seeds planted too deeply.
   - Seeds have been washed away while being watered or by rain.
   - Seeds are too old or improperly stored.
   - Poor seed contact with moist soil.
4. Plants have their own ways of promoting healthy survival. You may have noticed that sometimes the same plant grows in many different places. For this to happen, seeds travel to different locations. We are going to look more closely at seed dispersal. If possible, bring in some samples of seeds and brainstorm with the students about how seeds disperse. Have the students look around the school yard and collect seeds from local plants. Here are some ideas about dispersal methods:

a. Smaller, lighter seeds may fly through the air to a new location (e.g., dandelions).

b. Pointy seeds may get stuck in an animal’s fur and travel with the animal to a new location (e.g., burr).

c. Some seeds may be inside delicious fruits that are eaten by animals and then left behind as a waste product in another location (e.g., berries).

d. Some seeds may be hollow with a tough outer shell allowing them to float on water (e.g., coconut).

e. Some seeds are brightly colored to attract birds that carry them to other locations (e.g., corn).

*Go outside. If vegetables were not harvested last lesson, harvest those that are ready now. Follow the last part of Lesson 4 for this activity.

5. Check to be sure plants left in garden have enough water. Check to be sure plants have enough room — some may need to be thinned or weeded. Record development on Classroom Garden Care Chart.
Optional activities for classroom teacher
Note: These optional activities can be done at the end of the lesson (if time permits) or the classroom teacher can do activities with the students another time.

- **Match the Food Groups**
  Have students complete the Match the Food Groups (5-2) handout. The objective is to reinforce what each food group provides for our bodies and some of the characteristics of the foods in that group. Have the students draw their favorite foods in the boxes to the right of the food group names.

- **Recipe preparation** (see recipe section)
  Here are some recipes to try with the class: MyPlate Roll-Up or Sautéed Kohlrabi.

- **Snack idea**
  Provide a small snack that includes one food from each food group.

- **Food group meals**
  Have the students write down their favorite meal before the lesson. After the students have discussed the food groups, have them compare their meal to the current recommendations. Encourage students to substitute other favorite foods so that the meal includes a food from each food group.

- **What’s in my school lunch?**
  Have the students examine the school lunch menu every morning and determine what food groups are represented.

- **My healthy choices**
  Cut out pictures of foods from magazines and paste them onto a blank food group graphic (5-1) handout. Another option is to have the students draw pictures of their favorite foods on the handout. Display around the classroom.

- **Let’s plan a meal!**
  Have students design a meal of their choice using foods from all the food groups.
Eating from the Garden

Making Healthy Food Choices

Knowledge objectives:

• Students will identify the amount of food from each food group they need each day.
• Students will recognize how much food they are eating.
• Students will learn how to “put a garden to bed.”

Behavioral objectives:

• Students will choose moderate portions of healthy foods.
• Students will harvest vegetables at the appropriate time.
• Students will prepare the garden for spring planting.

Doing the lesson:

Gardening activities:

Core activity: Harvest and examine vegetables

Note: Suggest doing the gardening activities first this week and doing the nutrition lessons while the vegetables cook.

Discussion:

1. Review why it is important to know when to harvest produce. Review To Pick or Not to Pick (4-4) from Lesson 4, looking at the vegetables they planted.

2. Check your garden frequently during harvest time for ripe produce. When harvesting, be very gentle with the produce to avoid bruising or damaging it. Many vegetables are very perishable and have a short storage life once they are harvested.

3. Go out to the garden and harvest vegetables like collard greens that were grown for tasting.

Supplies needed:

- Handouts and family newsletters
- Beets
- Bowl, knife, grater, pan of clean water for rinsing
- Orange juice
- Lemon juice
- Parsley
- Tasting cups
- Spoons
- Examples of produce from garden to show maturity
- Supplies and equipment for preparation of garden vegetables
- Ingredients and equipment for recipe preparation (optional)

Portion-size activity:

- 2 large clear glasses (same size)
- 2 large cereal bowls (same size)
- 2 dinner plates
- Pitcher of water
- Box of cereal
- Container of cooked spaghetti (optional) (rubber bands will also work)
- Scoop or pasta ladle
- Hand towels
- Food models from Nasco listed below (optional)
  - ½ and 1 cup macaroni
  - ¼, ½ and 1 cup broccoli
  - 2-, 3- and 4-ounce hamburgers
  - ½ cup, 1 cup and 2 cups spaghetti
- Large and small plates
- Deck of cards
Advance preparation:

- Photocopy handouts 6-1, 6-2 and family newsletter (one copy per student)
- Make a bulletin board or poster of tip sheet 7
- Gather materials and garden supplies
- Wash and grate beets or prepare other foods from garden for tasting.

Core activities:

- Harvest and examine vegetables
- Vegetable tasting
- Portion-size activity

Handouts:

Make copies of these handouts:

- Portion Sizes Are in Your Hand (6-1)
- Serves You Right matching game (6-2)
- Family Newsletter 6

Refer students to:

- To Pick or Not to Pick (4-4)
- MyPlate (5-1)

4. Using tip sheet 7, Putting the Garden to Bed, explain to students that there is something else they will need to do with their teacher after harvesting vegetables.

**Discussion:** The garden needs a last tending before winter comes — we need to pull out all the plants and weeds. We need to rake any fallen fruits or vegetables. We can add all these materials to our compost pile (if available). Spread fallen leaves over the garden to a depth of 2 to inches. Turn the leaves into the soil with a spading fork and smooth the soil. Then we have “put our garden to bed” for the winter and we will begin planning for next spring’s garden.

5. Prepare foods for sampling. Use Collard Greens or another recipe.

Nutrition activities:

**Review of last Lesson**

1. What are the five food groups?
   Vegetables, fruits, grains, protein and dairy.

2. Why are whole-grain foods and fruits and vegetables good for us?
   They are high in vitamins, minerals and fiber to keep us healthy.

3. What two food groups should fill half our plate?
   Fruits and vegetables.

4. How much of our grains should be whole grain?
   Half of our grains should be whole.

5. When making protein and dairy choices, what should we keep in mind?
   Choose ones that are low in fat and sugar.

6. If we can’t have the plate half full of fruits and vegetables, when can we eat more of them?
   During snack time.
Core activity: Vegetable tasting

1. Introduction to beets:

Discussion: Today, we are going to see if more of our vegetables are ready to pick. Have you ever tasted beets or turnips? Do you remember which part of the plant are beets and turnips? (Roots) We are going to cook them today along with some other root vegetables. But before we cook them, let’s try some fresh beets. Did you know that one-third of the world’s sugar supply doesn’t come from sugar cane, but from a special variety of beets known as the sugar beet? Beets also have the distinction of being very rich in red pigment, and they’ll stain your hands if you’re not careful. In fact, borscht, a traditional Russian soup, is colored red with beet juice.


Core activity: Portion-size activity

1. Prepare one large glass with 1 cup (8 ounces) of water representing milk and cover with hand towel. Measure 1 cup cereal into one of the bowls and cover. Measure 1 cup pasta onto one of the plates and cover.

- Challenge a volunteer to pour eight ounces of water into the other glass without measuring. Uncover the filled glass and compare. How well did they judge? Ask how much milk they usually drink. We need three cups of milk each day. How many think they drink three cups each day? How many cups of other drinks like juice or soda do they drink?

- Challenge another volunteer to pour one cup cereal into the second bowl and compare to measured cereal. This represents one ounce equivalent of grains. We need about 6-ounce equivalents from the grain group each day. How much cereal would they normally eat? What other grain products do they often eat and how much?

Teacher references:
- Vegetable Harvest and Storage (6-3)
- Tip sheet 7: Putting the Garden to Bed

Optional activities for classroom teacher:
- Snack-size activity
- Recipe preparation
- Food diary
- Math activities
- Donate food to a pantry
- Classroom sharing
- School display
- Visit with the food service director

Additional tasks:

Note: The lesson requires that teachers have extra duties as a result of putting the garden to bed.

- Discuss what to do with additional produce.
- Pull out the rest of the plants and weeds.
• Challenge another volunteer to scoop one cup of spaghetti. (You can also use rubber bands to represent spaghetti.) Compare to the measured amount. This represents 2-ounce equivalents. Would you normally eat more or less? What else would you have with the cereal or spaghetti? Would it be easy to eat more than we need from this food group?

• Ask a student how many ounces of meat the deck of cards represents. Share that this is 3 ounces. Most people need 5 to 5½ ounces of meat a day. Do you eat more?

2. Discussion of the amount of each food group we need to eat (Use food models if possible.)

• The amount of food that one should eat from each food group is based on your age, gender, and level of activity. Mention each food group and how much they need for their age. The amount is what they need for the entire day.

   Show ½ cup and 1 cup macaroni food models on a small plate. Ask which is a normal ½-cup serving? Refer to cereal and spaghetti measurement activity to recognize 1-ounce equivalent portions. If you need 6-ounce equivalents a day, how would you get it?

   Let students suggest grain foods they might eat and how much they might have at breakfast, lunch, dinner and snack time to get the 6 ounces. (Use board to write down ideas.)

b. Vegetables: 2½ cups. Show ¼-, ½- and 1-cup servings of broccoli on a small plate. Have them identify a normal ½ cup portion. Children their age need 2½ cups of vegetables every day. Show them how the ¼, ½ and 1 cup broccoli together only adds up to 1¾ cups. They still would need ¾ cup more. Do they think they eat that much each day?

   Let students suggest vegetables they might eat and how much they might have at breakfast, lunch, dinner and snack time to get 2½ cups.
c. **Fruit:** 1½ cups. Let students suggest fruits they might eat or drink and how much they might have at breakfast, lunch, dinner and snack time to get 1½ cups.

d. **Dairy:** 3 cups. Refer to milk measurement activity to remember what a cup is. Let students suggest milk products they might eat or drink and how much they might have at breakfast, lunch, dinner and snack time to get the 3 cups they need each day.

e. **Protein:** 5-ounce equivalents. Show 2-, 3- and 4-ounce portions of a hamburger on a small plate. Have them identify a normal 3-ounce portion. Let students suggest meat, beans, eggs, nuts and seeds they might eat and how much they might have at breakfast, lunch, dinner and snack time to get the recommended 5 ounces. Remind them that ¼ cup beans, 1 egg, 1 tablespoon peanut butter and ½ tablespoon of nuts are 1-ounce equivalents.

- The grain and protein groups are labeled as ounce equivalents. We don’t have to weigh our food in this group, but we think of it as amounts that might equal an ounce. For example, one slice of bread is an ounce, ½ cup of pasta or rice is an ounce, one cup of dry cereal is an ounce. One tablespoon of peanut butter is an ounce as is one egg.

- Our goal should be to eat this amount each day from each of the five food groups. If we are still hungry, we should continue to eat a variety of foods from each of the food groups.

3. **How can we know how much we are eating if we don’t measure our food?** Distribute Portion Sizes Are in Your Hand (6-1) handout. You can use your hand to help judge amounts.

Show students food models of ½-, 1- and 2-cup portions of spaghetti and meatballs placed on a small plate. Ask if the ½-cup portion is enough for a meal? How about the 1-cup portion? Two cups? Two cups may look like a lot, but change the 2 cups spaghetti to a large plate and see if there is a difference in how much food there appears to be.

4. **Why do we need to watch our portion sizes?** We are seeing too much obesity today from eating too much food and not burning enough calories in physical activity. We get a lot of our calories from snacks and fast foods. We also don’t eat very many fruits and vegetables which are low in fat and sodium; they fill you up without a lot of calories.
**Review:**

1. **How much of our plate should be fruits and vegetables?**  
   *Half of our plate.*

2. **What can we use to remind us what a cup is?**  
   *Baseball or fist.*
   
   **½ cup?**  
   *Small computer mouse.*

3. **Why should we watch our portion sizes?**  
   *So we don’t eat too much for our activity level.*

4. **What is a grain ounce equivalent?**  
   *Amount of other foods in the grain group that equal a slice of bread in nutrients.*
Eating From the Garden
A nutrition and gardening program for fourth/fifth grade

Optional activities for classroom teacher
Note: These optional activities can be done at the end of the lesson (if time permits) or the classroom teacher can do activities with the students another time.

✽ Snack-size activity
a. Divide into groups of two and distribute packages or pictures of different snack foods. Give each group at least two sizes of a food. Have them look at the number of grams of sugar listed on the Nutrition Facts label and divide by four. Four grams of sugar equals one teaspoon of sugar (one cube or packet of sugar.) Have them count out the number of sugar packets or cubes that are in the packages.

b. Have them look at the number of grams of total fat on the Nutrition Facts label and divide by four again. Four grams of fat equals one teaspoon of fat. Have them measure out the teaspoons of fat and place on the brightly colored plates.

c. Have each group share with the class the food (including sizes) they are comparing and show the amount of sugar and fat in each size.

d. Discuss observations. Did it make a difference if the package was large or small? Would you eat the whole package? Could you “eat less” or “split it?” Were there some foods that would be better to eat in larger portions if you were hungry? (Example: pretzels, bagels, etc.)

✽ Recipe preparation (see recipe section)
Here is a recipe to try with the class: Collard Greens.

✽ Food diary
Have students record what they eat for one day and then compare their intake with food group recommendations.

✽ Math activities
Graph the results for the whole class’s food diaries. Determine the class average, or calculate the percentage of students who ate the recommended amount from each group.

✽ Donate food to a pantry
Take produce grown in the garden that is not used in tasting to a local food pantry. Even plant a special row for the hungry.

✽ Classroom sharing
Share produce from garden with cafeteria or another classroom, perhaps a younger grade to encourage their interest in growing fresh fruits and vegetables.

✽ School display
Make a display for the school with produce from the garden and/or pictures of students working in the garden and harvesting.

✽ Visit with the food service director
Have students talk with the school or district food service director about how school lunches could have more fresh fruits and vegetables.

Additional tasks:
Note: This lesson requires that teachers have extra duties as a result of putting the garden to bed.

• Discuss what to do with additional produce. Options would be to take them home, prepare them a different way another day, give to cafeteria to use in lunch program, donate to a shelter, etc.
• The teacher should take the lead in disposing the rest of the produce, cleaning out the garden area and putting the garden to bed until spring. (Use tip sheet 7)
• Pull out the rest of the plants and weeds. Cover with leaves and turn into soil. Divide the class into groups. Have groups assigned to different jobs (soil preparation, spreading compost, incorporating compost, weeding, harvesting, washing, etc.).
What's Inside a Seed?

Seeds come in many different sizes and shapes, but they still have the same three basic parts.

- **seed coat**
- **embryo**
- **stored food or endosperm**

**Examples:**
- Sunflower seeds
- Pumpkin seeds
- Sesame seeds

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Eating From the Garden
A nutrition and gardening program

Match the Food Groups

Directions: Draw a line to match each food group with the box that tells us what the group gives our bodies.

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<td>Foods from this group provide our bodies with fiber and energy from complex carbohydrates. We need carbohydrates for energy to do all the things we do every day.</td>
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<tr>
<td>Vegetables</td>
<td>Foods from this group are good sources of minerals and protein, which help our muscles grow and stay strong.</td>
</tr>
<tr>
<td>Milk</td>
<td>Foods from this group include plants with seeds, and are good sources of vitamins and minerals we need to stay healthy.</td>
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<td>Meat &amp; Beans</td>
<td>Foods from this group are good sources of calcium, and other nutrients that our teeth and bones need to grow and stay strong.</td>
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Eating From the Garden
A nutrition and gardening program

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Adapted from Nutrition to Grow On, California Dept. of Education

University of Missouri Extension, Eating from the Garden, 2010
The Life of a Bean Plant

Seeds mature

Seeds contain young plant

Seeds are removed and dried

Seed is planted

Fruit and seeds develop

Seed sprouts or germinates

Flowers are pollinated

Plant produces flowers

University of Missouri Extension, Eating from the Garden, 2010
Eating From the Garden
A nutrition and gardening program

Portion Sizes are in Your Hand
Use these everyday items to estimate the amount you eat.

A fist or a baseball = 1 cup
Eat 2½ cups of vegetables and 1½ cups of fruit each day. To achieve this, eat ½-cup portions several times a day.

Your whole thumb = 1 ounce of cheese
Eat low-fat cheese and yogurt and drink low-fat milk. You need 3 cups from the milk group each day.

Two 9-volt batteries = 1½ ounces low-fat cheese

Handful = 1 to 2 ounces of snack food
Snacking can add up — 1 ounce equals 1 handful of nuts of small candies or 2 handfuls of chips.

The palm of your hand or a deck of cards = 3 ounces of meat
Eat about 5 ounces from the meat and beans group each day.

One youth palm equals 2 to 3 ounces, depending on the size of the hand.

Your thumb tip = 1 teaspoon
Eat small amounts of high-fat foods like peanut butter and mayonnaise.

1 teaspoon is about the size of the end of your thumb.

A golf ball = ¼ cup
¼ cup is 1 serving of dried fruit or nuts

A small computer mouse = ½ cup
Use this to estimate ½ cup of fruit, vegetables, rice, beans or pasta.

University of Missouri Extension, Eating from the Garden, 2010
Eating From the Garden
A nutrition and gardening program

Serves You Right
Matching Game

Can you guess how much a serving is?

A serving of each food listed on the left matches up in size with one of the things on the right. Draw a line to connect each food with the correct object. Some objects will have several lines drawn to them.

1 cup milk
1 cup leafy vegetables
\( \frac{1}{2} \) cup vegetables, cooked
1 \( \frac{1}{2} \) ounces natural cheese
\( \frac{1}{2} \) cup rice, pasta or cereal, cooked
3 ounces meat, fish or poultry
1 slice bread
1 small apple, orange or medium pear
1 cup dry beans, cooked
\( \frac{1}{2} \) cup fruit, canned or chopped
1 cup ready-to-eat cereal
2 tablespoons peanut butter
1 cup yogurt
1 pancake or waffle
Eating From the Garden
A nutrition and gardening program

Serves You Right
Matching Game

Can you guess how much a serving is?

A serving of each food listed on the left matches up in size with one of the things on the right. Draw a line to connect each food with the correct object. Some objects will have several lines drawn to them.

1 cup milk
1 cup leafy vegetables
1/2 cup vegetables, cooked
1 1/2 ounces natural cheese
1/2 cup rice, pasta or cereal, cooked
3 ounces meat, fish or poultry
1 slice bread
1 small apple, orange or medium pear
1 cup dry beans, cooked
1/2 cup fruit, canned or chopped
1 cup ready-to-eat cereal
2 tablespoons peanut butter
1 cup yogurt
1 pancake or waffle
Eating From the Garden Recipes
A nutrition and gardening program

MyPyramid Roll-Up

Ingredients:

- 8-inch whole-wheat flour tortilla
- 2 lettuce leaves
- 2 or 3 apple slices, very thin
- 1 tablespoon grated low-fat cheese
- 1 teaspoon toasted sunflower seeds
- 1 teaspoon low-fat salad dressing (French, Ranch or Italian)

Equipment:

- Knife
- Cutting board
- Measuring spoons and cups
- Cheese grater
- Small bowls
- Baking pan or tray
- Plates, forks, napkins

Directions:

1. Wash hands and surfaces.
2. Lay tortilla on a paper plate. It is the base of your pyramid.
3. Put the lettuce leaves on the left side of the tortilla and the apples on the right side.
4. Sprinkle the cheese on top of the lettuce.
5. Place the seeds on the top of the apples.
6. Drizzle a little salad dressing over the top of all layers.
7. Roll your tortilla from the lettuce toward the apples.

Servings: 1

Nutrients per serving:

- Calories: 132
- Fat: 5g  Carbohydrates: 17 g
- Protein: 5 g  Cholesterol: 3 mg
- Fiber: 3 g  Protein: 5 g

Cooking term

Slice:
To cut into thin pieces with a knife or other tool.

Wash lettuce and apple with cool running water before using.
Eating From the Garden Recipes
A nutrition and gardening program

Sauteed Kohlrabi

Ingredients:
- 4 small kohlrabi, peeled and trimmed of leaves
- 1 teaspoon salt
- 1 medium onion, sliced
- 2 tablespoons butter or margarine
- 1 teaspoon dried basil leaves, crushed or 1 tablespoon fresh basil leaves, chopped

Equipment:
- Cutting board and knife
- Colander
- Dry measuring cups
- Measuring spoons
- Grater
- Rubber scraper
- Skillet with lid

Directions:
1. Wash hands and surfaces.
2. Grate the kohlrabi and place in a colander.
3. Sprinkle with salt and let stand for 30 minutes, then squeeze the water out.
4. In a skillet, melt butter or margarine.
5. Brown onion and stir in kohlrabi.
6. Turn heat to low, cover and simmer for 10 minutes.
7. Uncover and turn the heat to medium. Cook another 2 minutes.
8. Sprinkle with basil and serve.

Servings: 4

Nutrients per serving:
- Calories: 87
- Fat: 6 g
- Protein 2 g
- Vitamin C: 47 mg
- Carbohydrates: 9 g
- Cholesterol: 0 mg

Wash your kohlrabi with cool running water before using.
Grated Beet Salad

Ingredients:
- Juice of 2 oranges
- Juice of lemon
- 2 pounds fresh beets, peeled and grated
- ¼ cup fresh parsley, chopped
- Salt and freshly ground black pepper, to taste

Equipment:
- Toaster oven or oven
- Measuring spoons
- Knife
- Cutting board
- Baking tray
- Aluminum foil
- Plates and napkins for serving

Directions:
1. Wash hands and surfaces.
2. Combine juices and toss with beets and parsley.
3. Add salt and pepper.
4. Serve at once or chill until ready to serve.
5. Refrigerate leftovers.

Servings: 6

Nutrients per serving:
- Calories: 98
- Protein: 3g
- Fat: .3g
- Fiber: 6g
- Cholesterol: 0 mg
- Carbohydrates: 23g

Cooking term
Grate:
To shred or cut a food into fine pieces by rubbing it against a rough surface.

This salad can be made ahead of time, but hold the parsley until shortly before.
MyPlate

MyPlate tells us the recommended amount of each food group we need each day. It is based on age, gender and amount of activity we get each day.

Do you know where each of the food groups listed below goes on MyPlate?

How much do I need from each group?

<table>
<thead>
<tr>
<th>Food group</th>
<th>Foods included</th>
<th>Amount I need each day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td>Raw and cooked vegetables, vegetable juice</td>
<td>2½ cups</td>
</tr>
<tr>
<td>Fruits</td>
<td>Apple, orange, mango, dried fruit (raisins), fruit juice</td>
<td>1½ cups</td>
</tr>
<tr>
<td>Grains</td>
<td>Bread, tortillas, rice, pasta, cereal</td>
<td>6-ounce equivalents</td>
</tr>
<tr>
<td>Protein</td>
<td>Meat, eggs, nuts, peanut butter, beans</td>
<td>5-ounce equivalents</td>
</tr>
<tr>
<td>Dairy</td>
<td>Milk, cheese, yogurt</td>
<td>3 cups</td>
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</table>

Adapted from Nutrition to Grow On, California Dept. of Education

University of Missouri Extension, Eating from the Garden, 2010
How can I tell how much I am eating? Here are some great hints that will be easy for you and your family to remember.

½ cup of cooked noodles is about the size of a small computer mouse.

A 3-ounce portion of meat is about the size of a deck of cards.

1 slice of bread is about the size of a CD.

1 cup of cooked vegetables is about the size of a baseball.

Family activity

Are You Eating Enough Fruits and Vegetables?

For the next three days, keep track of how many fruits and vegetables your family eats.

Directions:
• List your family members' names, including yourself, on the left. (Use a separate sheet of paper, if necessary.)
• Starting today, draw a ☺ under Day 1 each time you eat 1 cup of fruits or vegetables.
• Tomorrow, draw ☺'s under Day 2 and the next day draw ☺'s under Day 3.
• Who in your family eats the most servings of fruits and vegetables?
• Bring this back to class as soon as you have completed it!

<table>
<thead>
<tr>
<th>Family members</th>
<th>Day 1</th>
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# Lesson Five: How Do You Plan a Garden and Our Healthy Garden Plan

For January

“Our Healthy Garden Plan” from GROWING IN THE GARDEN: LOCAL FOODS AND HEALTHY LIVING, Iowa State University Extension and Outreach. Students decide what cool season and warm season crops they want to grow by making and eating Lettuce Wraps and Fresh Garden Salsa. Using science and math concepts, they create their own Healthy Garden Plan, markers to go with it, and a calendar.

## Content objectives:
Identify and select locally grown fruits and vegetables to plant, grow, harvest and eat; use a variety of mathematical and science concepts and skills to create local garden plans and calendars.

## Life Skill objectives:
Healthy lifestyle choices, Critical thinking, Communication, Citizenship, Leadership, Decision making, Problem solving,

## Core and STEM concepts and skills:

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<th>Math</th>
<th>Language Arts</th>
<th>Social Studies</th>
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<td>Science as inquiry, Earth and space, Life science</td>
<td>Operations and algebraic thinking, Numbers, Measurement and Data, Geometry, Mathematical practices</td>
<td>Reading, Speaking, Listening, Viewing</td>
<td>Economics, Geography</td>
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## Healthy snack:
Lettuce Wraps with Salsa

## Additional and supporting resources:
Cooperative Extension Master Gardener’s Program can be a resource for developing your garden plan.
LESSON PLANS FOR 2012-13 SCHOOL YEAR, GRADE 5

January: How do you plan a garden the second year?

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  Iowa State University Extension and Outreach 16

Garden Journal: See the Before section of the Lesson Plan

Recipes: Lettuce Wrap and Salsa, See the Do section in the lesson
BEFORE THE LESSON

1. Grade 5, January: Planning the Garden, Year 2
This document contains all the curriculum items and resources you need for this lesson. All lesson downloads are located on the www.peoplesgarden.wsu.edu Educational Toolkit.

2. Gardening Tips for Working With Kids, Healthy Gardens, Healthy Youth Partnership
   How do you plan a garden? Iowa State University Extension and Outreach
Master Gardeners and extension educators created the tip list based on their experiences gardening with kids for this project and for related summer programs. You may want to make a copy to keep handy throughout the gardening season. The garden planning document reviews the basics about starting tilled, raised bed or container gardens. You may want to read through it to see what you need to do for year two of this project. You may want to add more soil to the raised beds. Talk with your Extension Educator about obtaining additional tested soil.

3. Have a planning meeting
A few weeks before doing the planning lesson, have a meeting with the all the adults that were involved in the fourth grade gardens and that want to be involved in the fifth grade gardens. Make copies of the Gardening Tips for Working With Kids to distribute at the meeting. You are about to use the same classroom planning lesson as the fourth grade teachers used, skipping some of the preliminaries and getting right down to the business of planning the fifth grade gardens. You may want to watch the planning lesson video recorded for the 4th grade lesson on the Healthy Garden, Healthy Youth YouTube Channel. With that in mind, here are the basic topics to discuss at the meeting. Someone should be recording the information to be used for this year’s gardens and planning experiences.

   A. After last year’s experience in preparing the gardens and planning the gardens with the students’ help, are there any experiences, recommendations, changes or suggestions to pass on for the second year of gardening?

   B. Are there some chores to do in the gardens before they are ready for the fifth graders? List the chores and make a plan to get them done. To assure that the students, teachers, school and community have positive and sustainable gardening experiences, your state probably has some grant money budgeted for the year two gardens.

   C. The students will start their garden planning with a question about what they want to do with the produce they harvest in the garden. Some possibilities could be growing food for the school lunch program, their families, Grow a Row for the Hungry, the local food pantry, or to sell. Does anyone have some suggestions or thoughts about the purpose of the 5th grade garden?

   D. The students will taste fruits or vegetables that they could plant as cool season and warm season crops. Are there any suggestions on fruits or vegetables that the adults would like to plant with the students? Come up with three or four options for each of the cool and warm season crops so the students have an opportunity to make choices on what they would like to plant. Are there any recommendations regarding purchasing and preparing the samples for this lesson and others? Students have been and will continue to do a lot of the food preparation for these lessons.
E. We highly suggest trying the square foot gardening method to get the most out of small garden spaces as possible, to make it easier to plant the garden, and to eventually make it harder for weeds to grow. Refer to the lesson to learn more about this method and assign people the task of making square foot garden templates 1 and 2 from the patterns at the end of the lesson. Poster board works the best. It is nice to have at least two of each size. They will be used in the planning lesson.

F. The students will be using garden grids, charts, and calendars to plan their fifth grade garden. It would be helpful if a Master Gardener or a garden expert could help with the planning lesson so that the students can eventually come up with the garden plan that they will actually use. The students also need help to start a garden calendar that they can follow in your region. Make a plan for a garden expert to work with the teacher and the students during the planning lesson. Share a copy of the lesson and The Lesson section below so that everyone can be ready.

4. Garden Journals
If they haven’t done so already, this is a good time for each student to start his or her own Garden Journal. Each time you do a lesson or go out in the garden there is an opportunity to add something new to the Garden Journal. Provide 1” vinyl binders or sturdy plastic folders with 3-ring binders so that students can take their journals to the garden and add pages, activity sheets, charts, recipes, etc.. The binders with a window on the front are nice because students can design their front cover on a heavy piece of paper and slip it into the sleeve. The students can also design their own inside cover page. Provide permanent markers so they can at least creatively write the title, using their first and last name such as “Charlie Smith’s Garden Journal”, on the front of the binder or folder. We have found that it works best to collect the journals after each use. See The Lesson section, Garden Journal Page, for more details. Your extension service may have other suggestions for garden journals.

5. Taste testing
Prepare to make the Lettuce Wraps and the Garden Salsa found in the Do section of the lesson. The students can help to make the salsa or you can buy a comparable salsa at the store. The Lettuce Wraps should include the cool season crops suggested in number 3. If there is another recipe that would better suit the warm season crops suggested in number 3, then substitute that recipe. You may want to go to the Harvest lessons for warm season crop recipe ideas.

THE LESSONS
1. Our Healthy Garden Plan is a lesson that you can divide into more than one day. Some of the students have done at least parts of this lesson. For fifth graders, we are skipping over some of the activities and concentrating on other parts that might have been missed. Here are the activities that we recommend.

A. Replace the Introduction section with the following questions.

By a show of hands, how many of you planted the school garden last year?
What did you grow?
How did things turn out?
Based on your experiences, what would you like to plant this year? (Make a list of the crops they would like to plant.)
There are lots of ways we could use the vegetables (and fruits) that we will grow besides just eating it ourselves. What are some other meaningful ways that we could share what we harvest? (Make a list of the student’s ideas. Add in the ideas from number 3 in the Before the Lesson section. Discuss the options and take a vote on what the class wants to do with their garden produce.)

B. Go to the “Garden Choices Through Taste Testing” activity in the Do section. Explain to the students that they will be taste testing to see what crops they might like to grow. First they will taste the Lettuce Wraps and decide on cool season crops. Then they will taste the Salsa or another recipe and decide on warm season crops. Remind the students about what they chose to do with their garden produce as they vote on the crops they want to grow.

C. The next activities can be done on a different day. With help from Master Gardeners or other garden experts, make the 5th grade garden plan according to the activities in the Reflect section.

D. Make the Garden Labels and start the Garden Calendar in the Apply section.

AFTER THE LESSON
1. Have the students keep their garden plans in their Garden Journals. On the back of the page, have the students write down what they are going to do with the garden crops. Then have them list the crops that the class chose to grow. If their idea was not the one that was chosen, or if one of their crops did not survive the vote, have them write down their idea and the crops they wanted to grow. If the class discovered that all the crops would not fit in their garden space, have them note that as well. Suggest that they could grow their own crops at home or in a neighborhood or community garden and use the harvest in multiple ways.
USDA FNS People’s Garden School Garden Pilot Project: Healthy Gardens, Healthy Youth

Tips for Working with Kids and the Garden

The following tips are from HGHY Master Gardeners and site leaders and are based on their experiences gardening with kids. These are tips for both school and the summer programs. A sample in-garden lesson outline can be found at the end of this document.

Be Prepared

- Send home information about the garden program including the details about who is leading the program, what the kids will be doing, where the gardens are located, when the kids will be gardening, what is happening with the garden produce, and expectations of the young gardeners. All gardeners should be wearing close-toed shoes and have sun protection. They will not be allowed to work in the garden or with food if they are sick or have been sick within the last 24 hours.

- Every time you go to the garden, take supplies such as a first aid kit, wet wipes, water jug with cups (or have kids bring their own water) and water for washing the produce.

- Use lesson plans and educational resources to prepare for each session. Play a game, sing a song, act out a play, read a book, or make a garden-based craft each session. Remember to have fun! See the Sample Garden Session outline at the end of these tips.

Working With the Kids

- Make sure the young gardeners know the 3 R’s garden rules: Respect, Responsibility, Readiness.

- Be fully prepared before heading to the garden so there will be little down time for the kids. The tools and any supplies should be easy to access and ready to go. Break large groups into manageable sizes. Have more than one activity and rotate them. Keep every child busy and on task or their attention will shift and they will drift. Have enough adult supervision to make this happen.

- Always demonstrate before letting the kids work on their own. The more adult helpers you have to float around and guide the kids, the better. Do not do things for the kids, show them how and have them show you how back.

- Check their work. Don’t take their word for it when they say they have completed a task. You might find that things were missed.

- Take frequent shade and water breaks. Break times are good times to introduce healthy snacks, books, garden journals, or other hands-on activities.

- Every child will appreciate some one-on-one time with instructors while working in the garden. Let them tell their stories and show you the weeds they found and pulled, etc.
Planning the Garden

- Use the hands-on, deeply aligned classroom lessons to help the students plan their gardens. The kids will have fun learning and taking ownership of the garden. They will get excited about choosing what to plant and how much they need to plant by doing these lessons. A Master Gardener or an experienced gardener is a valuable resource to help kids discover what crops can be grown in the climate and in the amount of space they will have to garden. Start a Garden Journal or Garden Records right away.

- Young students are not able to prepare the site for gardening. Master Gardeners and others can provide leadership for that. FFA students, parents, Ameri-Corps, Food Corps, garden clubs, retired teachers, neighbors and others have been instrumental in preparing the gardens and helping the youth in the planning stages.

- For the young children, have the sections of the garden already measured out and marked according to the garden plan. For the older youth, help them measure and mark the garden sections.

- Kids like to use garden tools, but they LOVE to use child-sized tools such as kid-sized rakes, hoes, shovels, watering cans, and gloves. The type of garden tools they need depend on the type of garden they will be working with and how it is planted – square foot vs. rows. They can share tools. Older students have been using adult-sized tools and even tools that have been loaned by Master Gardener groups.

- Master Gardeners and FFA members are using their green houses to start seeds and grow transplants for the school gardens.

Help the students start a compost bin and get the whole school involved.

Planting

- Go over tool safety rules for hoes, trowels, and rakes. A tool safety game is part of the gardening curriculum.

- Go over ways the plants in your garden are going to be planted: seeds, sets, transplants, seed pieces.

- Plant fast growing (cool season) crops like radishes and spinach for early satisfaction. Try to stagger your crops for constant harvest opportunities. Make sure the students will have something to harvest when they return to school in the fall.

Maintaining

Watering

- Watering is extremely important, especially in raised bed gardens. If you are meeting just once a week, you may have to make plans for additional watering. Families, youth groups, organizations, neighbors can sign up for times. Someone will need to be responsible to make sure the watering plans are carried out.

- Using a watering wand is a good way to water the garden. Show how to water at the base of the plant. Teach the kids to count how long it takes to water a plant.
Weeding
- Help the kids distinguish the difference between weeds and garden plants. Show them how to pull weeds so that the garden plants are not disturbed. Tell them where you want them to put the weeds. Have challenges such as finding the biggest weed, most unusual weed, most weeds, etc. Talk about why some parts of the gardens have more weeds than other parts, etc.

Insects and pests
- Insects intrigue and scare children. They enjoy doing the lessons about pests and going on hunting missions to find and eradicate them. Getting to show everyone the squash bug they found – and sometimes their eggs – is a joy in and of itself!
- Use the lessons from Grades 2 and 4 to identify “good guys” and “bad guys” in the garden and to figure out what to do about them. Then help the kids take the next steps to protect their garden from unwanted pests.

**Harvesting, Preparing and Eating the Produce!**
- Kids get excited when they see fruits/vegetables growing on the plants. Make sure that they show everyone by pointing and not picking! Describe what to look for to determine when the fruits/vegetables are ready to harvest.
- Show kids HOW to harvest produce gently. For example, gently hold a bean plant before pulling off the bean, cut the lettuce with scissors, etc.
- Kids love to harvest and taste the bounty. Try to include this in every lesson.
- Include in the lesson, ideas for how the food can be eaten. Simple recipes such as cucumber-flavored water, radish or veggie sandwiches, veggies with dip, cucumbers and onions in vinegar, etc. are the best. Get a large bottle of Ranch dressing because the kids will try anything they can dip! There are several ideas in the lessons.
- Show the whole vegetable before cutting it open. Have them find the seeds.
- Plastic plates and knives can be used for cutting and preparing produce.
- Help the kids put their gardens to bed.
Sample Gardening Session

1. Meet in gathering area
   a. Remind everyone about behavior expectations.
   b. Chat a bit – What’s up?
   c. Give garden plan for the day
   d. Split into smaller groups if necessary
   e. Have a planned garden activity for each group with an adult supervisor

2. Garden projects
   a. Planting
   b. Weeding
   c. Pest patrol
   d. Watering
   e. Harvesting
   f. Washing
   g. Cutting (if necessary)

3. Snack time
   a. Make their own snacks
   b. If there is nothing to harvest, consider produce from farmer’s markets
   c. Focus on fruits and vegetables
   d. Send ideas home to the families

4. Activity session – see lessons for ideas for games, songs, stories, plays, crafts

5. Go home!
How do you plan a garden?

UNIT 4 INTRODUCTION

LESSON CONTENTS

General Information
Our Food Garden Plan (Grades K through 4)
Our Healthy Garden Plan (Grades 4 and up)

GENERAL INFORMATION

GETTING STARTED

Gardens may become as prevalent on school grounds as swing sets. In a recent National Gardening Association Survey, What Gardeners Think, 97 percent of 2,500 households surveyed said they thought schools should provide gardens and hands-on gardening activities for kids. Of that total, 39 percent felt that gardening activities should be implemented in schools whenever possible, and 19 percent felt that they should be implemented in every school.

Having at least one advocate for school gardening is a key factor for success. Who might be a school garden advocate where you live? Is it a teacher, food service director, administrator, school nurse, board member, parent, grandparent, PTO, school organization member, student, community garden coordinator, local food producer, or a service organization? You need their energy and inspiration to plan your garden. However, they should not be expected to do everything. It is important to have support from several representatives of the school system and the community.

The more community support you have for your garden, the more likely it will become a permanent part of your community. Many types of support can be found in your neighborhoods. Extension Master Gardeners and Master Conservationists have had extensive training and are expected to contribute volunteer hours back to their communities by sharing their expertise. There are 4-H Club members that are interested in gardening and are developing their healthy living, communication, citizenship, and leadership skills which would contribute positively to your gardening experiences. Contact your local county extension office to identify and invite Master Gardeners and 4-H’ers to participate in your garden project. Your local high school may have Future Farmers of America (FFA) members or student leaders interested in garden-related topics. Many communities have garden clubs, senior groups, service organizations, churches, institutions, agencies and after-school programs that could enhance your gardening program. Invite them into your gardening conversations and planning sessions.

SITE SELECTION

A school garden serves several functions. It can be considered an outdoor classroom where children explore and interact with nature through first hand experiences. It can also be a park-like place for recreation and fresh air. Similar to the swing set or soccer field, a garden is a fairly permanent fixture on the school ground. With that in mind, there are several factors that should be considered when finding the best location for a school garden.

General Information continued on the next page.
Checklist for locating a school garden

✓ Sun. The site should receive at least eight hours of full sunlight per day.

✓ Drainage. Don’t locate the garden in a low area on the school ground or a spot that doesn’t drain well. Watch the area after a heavy rainfall. Does the water sit in a puddle for an hour or more or does it soak in and drain quickly?

✓ Soil. A loam soil is ideal for a garden, but not always possible. Find the best possibility; if your site has poor soil, consider using raised beds or containers.

✓ Water. Locate the garden within a hose-reach of an outdoor spigot. To be productive, garden crops require at least an inch of water per week.

✓ Away from play areas. Although you don’t want the garden in a remote location where no one sees it or is a long hike to get there, you also don’t want it where children play or walk.

✓ Check underground. Before digging anywhere, be sure that nothing, such as cables or other lines, are buried in that area. Call your local utilities to mark where buried lines are located. In some state, this service is provided free of charge. (If you live in Iowa, see the side column).

✓ Tool storage. Find an indoor area close to the garden where tools can be safely stored when not in use. A large, locked and weather-proof container placed next to the garden will work.

✓ Possible locations. Besides at schools, children’s gardens for after-school programs or summer programs can be located at community garden sites, fair grounds, empty lots, arboretums or parks, or near public buildings such as libraries, churches, extension offices, etc.

For more information on school gardening or after school programs, refer to A Toolkit: How to Start a School Garden by Alliance for a Healthier Generation. A link to this publication can be found at www.extension.iastate.edu/growinginthegarden or go directly to www.HealthierGeneration.org.

SITE PREPARATION FOR TILLED GARDENS

A tilled garden is a traditional garden tilled in existing soil, similar to a field. Gardens come in many sizes and shapes. The size and type of a children’s food garden depends on the soil, available space, and financial resources. Often times it is better to start small. The number of classrooms or children that will be participating in the garden and the number of volunteers available to help maintain it will help determine the size. If the garden is too large, it quickly becomes an overwhelming task. For these reasons, a 20’ x 40’ food garden is recommended. Tilled gardens allow for wide flexibility in the types and quantities of crops that are grown. Long rows of beans, lettuce, tomatoes, and squash can be planted to provide a sizeable harvest.

Prepare the site. If the site you have selected was previously a grassy play area, the sod will need to be removed. Plan ahead. It is best to prepare the garden site the previous fall so that it is ready to till and plant the following spring.

Don’t forget to have the area checked for underground utility lines before digging!

1. Measure and stake the designated area and use a string to outline the area. Although plowing or tilling the sod can be done, it is often difficult to destroy all the clumps of sod and they often re-grow, creating weed problems later in the season. A non-selective herbicide, such as Roundup®, can be applied to kill the grass followed by tilling a week or two later.
2. Do not work the soil when it is too wet because dense clods of soil will form which will be difficult to work out and will impede good germination of garden seeds. To determine if the soil has the right amount of moisture, take a handful and squeeze it gently. If it forms a tight clump or “ball”, it is too wet. If the “ball” crumbles under pressure, it is ready to be tilled or prepared for planting.

3. Have the soil tested for fertility in the fall or prior to planting in the spring. This will help you determine your fertilizer needs. Many state land grant universities have soil testing laboratories. Contact your local county extension office to find a soil testing lab in your state. For information on taking a soil sample for testing, refer to Soil Sample Information Sheet for Horticulture Crops, available for download at: www.extension.iastate.edu/store/. Use the search box to locate publication number “ST 0011”. This might be an excellent activity for a middle school classroom to perform. The results from the soil test will be returned with fertilizer recommendations. If your garden site is “reclaimed” land within a city, it is important to have the soil on the site tested for potentially hazardous materials.

4. Soil texture can be improved by mixing in some compost, especially if the soil has too much clay or sand. If compost is applied, be sure it is well decomposed and work it thoroughly into the soil. Don’t apply too much - an inch-thick layer will go a long way. Although compost can be purchased, you may find that your city has free compost available for gardeners. It would be good learning experience if you include a compost pile in school garden project.

5. Apply the recommended amount of a complete analysis fertilizer, such as a 10-10-10, just prior to working the garden soil in the spring. A general recommendation is 20 pounds of 10-10-10 per 1,000 square feet of garden space. (Six raised garden beds that are 4 feet by 8 feet would typically require about 4 pounds of this fertilizer.)

Many of these steps are integrated into the student activities in this unit.

PLANNING WHAT TO PLANT IN A TILLED GARDEN
Planning what to plant in your tilled garden involves determining what you want to plant, how much to plant, when to plant it and how to plant it. What to plant depends on how you intend to use the garden produce. Will you prepare it for students to taste in a classroom? Will you give it to the school kitchen staff to prepare as samples or vegetable servings for the students’ lunches? Your answers affect the quantity of each crop you intend to grow. When determining the use, be sure to take into consideration the quantity of each crop the garden has the potential to grow and when it will be in season. The garden schedule and planting plan may include planting quick-maturing crops, such as leaf lettuce, green onions, radishes, and spinach in the spring. In early summer, plant crops that will come into production when the students are back in school, late August and September, such as tomatoes, peppers, green beans, and squash. Information on the labels for transplants and seed packages will tell you approximately how many days are need from planting to maturity for each crop. Count back that many days from the first day of class in the fall to determine the optimum planting day so that crops will be ready when the students return to school.

There are numerous resources available to guide you through planning and planting a garden. Your state’s university extension likely has publications online to help you select the right varieties and planting times for your area. The lessons and additional resources pages in this unit will help you to plan what to plant. Local Master Gardeners, garden experts, and local food producers are also excellent resources.
RAISED BED GARDENS

Raised beds are gardens framed with lumber, bricks, or concrete blocks. They are typically 4 feet wide and any length, depending on the size of the lumber used to construct the bed. Many commercial kits for raised beds are 4 feet wide and 8 feet long. They can be any height, although most are 6 to 12 inches tall. Do not use pressure-treated lumber, such as wolmanized wood for raised beds that will produce food crops. Railroad ties are not recommended for edible gardens. Cedar lumber is durable and has its own natural preservatives. Pine can be used provided all sides are painted with exterior latex paint or treated with a suitable, safe wood preservative. Raised bed frames made of recycled plastic are long lasting and durable. They do not require maintenance and do not splinter.

Raised beds offer a good alternative to traditional tilled gardens. Advantages of raised beds include:
1. You can garden in areas with poor soil conditions.
2. You can control the soil mixture in the raised beds to improve drainage and nutrient content.
3. It is easy to plant, weed, water, and harvest working from outside of the raised beds.
4. The narrow beds enable reaching in to do the work so that no one walks in the garden - resulting in less foot traffic and compaction of the soil and reduces the risk of stepping on plants where the plant roots will be growing.
5. You can plant more crops and increase yields because there are no walkways through the raised beds.
6. The soil in the beds warms up faster in the spring enabling earlier planting.
7. Watering is more efficient because the water is directed to the plant beds and not the walkways. Plants can be planted closer together to shade the soil and reduce the amount of water evaporation from the soil.

In addition to choosing a site that receives full sun, a site for raised beds needs to be level.

You may want to consider watering by using a simple drip irrigation system. These watering systems are readily available and can make watering much more efficient, effective, and tidy. The drip lines emit a small amount of water over a long period of time and the foliage is not wetted, reducing the incidence of foliage diseases. Drip irrigation kits can be found at home improvement stores and garden centers.

Mulching conserves soil moisture and helps to control weeds. Several materials make good mulches. Grass clippings make a good mulch when spread in two inches thick. Avoid clippings from chemically-treated lawns. Newspapers also do a great job preventing weed growth and will decompose by the end of the season. Overlap four to six sheets of black and white newspapers between the plants and rows. Water it well and cover it with a thin layer of grass clippings or soil to hold it in place.

MATERIALS AND SUPPLIES

50’ Tape measure
Stakes for markers
Six raised bed kits or lumber and brackets
Mallets or hammers
Landscape fabric (based on plan below - at least 800 square feet)
Soil mix (⅓ cubic yard per 4’ x 8’ raised bed, see Step 4, check with your city for access to free compost)
Wood mulch (see Step 5, check with your city for access to free mulch)
1. Stake out the area where each raised bed garden will be located. Include a walkway between each bed. (See an example of a layout in the diagram below). The walkways should be at least four feet wide or wide enough to maneuver a wheelbarrow or wagon down it, and allowing four feet around the entire area. Although the beds will smother grass under them, you may want to destroy the sod in the walkway areas. This can be done with a non-selective herbicide, such as Roundup® a week before installing the raised beds and walkways.

2. Lay landscape fabric in the walkways between the beds and four feet around the beds to prevent weed growth and allow for easier maintenance. When installing the raised beds, tuck the ends of the landscape fabric under the side walls as they are being placed. This will secure the fabric so that it doesn’t come loose on the edges. Use landscape pins to hold the outer edges and overlapped pieces of fabric in place.

3. Construct the frames for the raised beds, set them in place, and secure them with corner stakes.

3. Fill the beds with soil mix. A good fill for raised beds is a combination of two-thirds topsoil and one-third compost. Check with the city to see if they have free compost available. (If compost is not available, peat moss can be substituted but it is expensive.) Topsoil and compost is often sold and delivered by the cubic yard. Each 4’ x 8’ x .67” (8”) bed will need approximately .8 cubic yard of soil mix. With that in mind, six beds will require 5 cubic yards of mix, of which 3.5 cubic yards are topsoil and 1.5 cubic yards are compost. Mix it together well. Fill the beds to within one inch of the top; settling will occur.

4. Cover the landscape fabric with wood mulch. To determine the amount of mulch you will need, follow the instructions in the box below.

5. Sprinkle one cup of a complete analysis commercial fertilizer, such as a 10-10-10, over each 4’ x 8’ bed each year, just prior to spring soil preparation. Work it in or till it into the soil.
PLANNING WHAT TO PLANT IN A RAISED BED GARDEN

Although a 4’ x 8’ raised bed garden offers only 32 square feet of growing space, it can produce a surprisingly large amount of produce. Planning what, when, where, and how you are going to plant is important before you purchase the seeds and plants. Raised bed gardens can often be planted earlier than traditional gardens because the soil in the raised bed warms up and dries out more quickly in the spring. You may want to plant cool season crops in late April so that you can have a salad garden party before school is out in late May or early June.

Raised bed gardens are narrow so that nearly all of the activities in the garden can be done outside the bed by reaching in. This avoids the need for walkways or wide spaces between the rows for walking and allows you to put plants closer together. Another strategy to make the most of the available space is to use the "Square Foot" method of gardening, developed by Mel Bartholomew. There are square foot gardening templates in the back pocket of this curriculum. Lesson 4A provides instructions on the square foot method of gardening. You may want to use the templates as patterns to transfer it to sturdy poster board. Refer to the resources below for additional information.

The lessons in this unit will provide opportunities for students to engage in planning and preparing the gardens in anticipation of planting.

CONTAINER GARDENS

Plants can be grown in containers or pots that can be placed inside, outside, or both. They can be placed on a dolly enabling them to be easily moved. You may want to plant container gardens to start some of your garden crops indoors in late winter or early spring. After the weather warms up and the threat of frost is past, the containers can be moved outside.

A good container for plant growth must meet the following four criteria to successfully grow plants.

1. Sturdy
2. Clean
3. Room for roots
4. Adequate drainage

The following items can be adapted into container gardens.

- Planter
- Bucket
- Wheelbarrow
- Hanging basket
- Clay pot
- Wagon
- Ceramic pot
- Strawberry jar
- Eggshell
- Paper cup
- Old pan
- Old bowl or teacup
- Bathtub
- Old shoe or boot
- Child’s plastic swimming pool

Fill container gardens with quality potting mix. Do not use soil straight from a field or garden area. It may grow crops well in the field, but when put in a container, this soil will become very heavy and compact with small pore spaces for air and water.

Container gardens can be fed with slow-release fertilizer beads that are added to the soil mix in the container prior to planting. Some slow-release fertilizers feed the plants for three months and others may only require application once every six months. The amount to add is determined by the volume of soil in the container. Slow-release fertilizers are advantageous and easy because they release a small amount of fertilizer every time the soil is watered.
The soil in container gardens should be kept moist but not soggy or saturated. It dries out more quickly as the plants grow because the space in containers becomes more limited and the roots can't spread out or grow deeper to find water.

The soil in container gardens needs to be checked nearly every day. Clay, or terra cotta, pots dry out more quickly than plastic containers and need water more often because they are porous. Also, be aware that soil in small containers set in sunny locations dries out quickly. When fruit or vegetable plants dry out, they wilt. Flowering and fruiting plants will drop their blossoms and fruits. Leafy vegetables will develop brown or dried leaf edges.

There are unique types of container gardens, such as EarthBox® (www.earthbox.com) and Global Buckets (www.globalbuckets.org) that are somewhat self-watering and feeding gardens. EarthBox® containers are commercially available gardening systems developed to meet the needs of gardeners who lack space and quality soil for successful gardening. Global Buckets are similar in concept, but can be made from materials found at home, school or a hardware store.

These container garden systems provide:
- Good soil (or a "soil-less" potting mix) that is well-drained and provides good air and water movement
- An adequate and regular supply of water
- Fertilizer for good plant growth
- Soil cover (plastic mulch) to reduce evaporation and prevent weed growth

EarthBoxes® and Global Buckets water the plants by wicking water from a reservoir below the soil medium. There is usually enough water for the plants; however, it is a good idea to occasionally check the moisture level in the soil and add some when necessary.

Iowa State University Extension Publications available to download as pdf files:
Go to: www.extension.iastate.edu/store

Pm-731, Harvesting and Storing Vegetables
Pm-819, Planting a Home Vegetable Garden
Pm-534, Planting and Harvesting Times for Garden Vegetables
Pm-870A, Small Plot Vegetable Gardening
Pm-607, Suggested Vegetable Varieties for the Home Garden

## Our Healthy Garden Plan

### CONTENT OBJECTIVES
Identify and select locally grown fruits and vegetables to plant, grow, harvest, and eat. Use a variety of mathematic and science concepts and skills to create local garden plans and calendars.

### LIFE SKILL OBJECTIVES
Critical thinking, Problem solving, Decision making, Healthy living, Communication (listening, asking, and responding to questions), Citizenship (teamwork), Leadership (sharing an idea to improve something)

### INDICATORS EVALUATIONS
Students will develop a productive garden plan that will demonstrate how much healthy food can be grown in a limited amount of space.

### SUBJECT STANDARDS

#### CORE CONCEPTS AND SKILLS
- **21st Century Skills:** Employability skills, Health literacy
- **Science:** Science as inquiry, Earth and space, Life science
- **Mathematics:** Operations and algebraic thinking, Numbers and operations, Measurement and data, Geometry, Mathematical practices
- **Social Studies:** Economics, Geography
- **Literacy:** Reading, Speaking, Listening, Viewing

### LEARNER TYPES
Linguistic-words, Logical-mathematical, Spatial-visual, Bodily-kinesthetic, Interpersonal, Intrapersonal, Natural

### MATERIALS
- **Too Many Pumpkins** by Linda White
- **Garden Grid** *(one copy of two pages per group, see the Introduction and Reflect sections found at the end of this lesson.)*
- **Pencils**
- **Rulers**
- **Seed Catcher** *(one per student, found at the end of this lesson)*
- **Lettuce Wrap ingredients and supplies** *(See the TEACHER’S NOTES following this Materials List and of the Do section.)*
- **Small plates** *(one per student)*
- **Napkins** *(one per student)*
- **Salsa ingredients, chips, and supplies** *(See the TEACHER’S NOTES following this Materials List and the Do section, Fresh Garden Salsa recipe is found at the end of this lesson)*
- **Square-foot gardening templates and one poster board** *(Use the poster board to make one example of each template, found at the end of this lesson)*
- **Plant Spacing for Square-foot Gardening** *(see Reflect section, found at the end of this lesson)*

*Materials continued on the next page.*
**TEACHER’S NOTES:** Here is a list of potential local partners who can provide expertise, time, energy, supplies, and/or funding: School staff, volunteers, and older students (from classrooms, foodservice, maintenance, administration, high school organizations); extension staff, volunteers, and organizations (such as master gardeners, 4-H club members, nutrition programs such as EFNEP, specialists or agents); local foods producers; gardeners; farmer’s market vendors; local foods restaurants; grocery store produce managers; local organizations, businesses, and interested and knowledgeable individuals of all ages and cultures. These people can help you use this lesson and apply the activities to where you live and your garden program.

The Do/Explore section includes taste-testing activities with Lettuce Wraps and Fresh Salsa. You will need cool season crops such as lettuce, spinach, radishes, and onions for the Lettuce Wraps. Garden fresh salsa may be purchased in the produce department at your local grocery store, or you can have your class make salsa using the Summer Garden Salsa recipe found at the end of this lesson. See the TEACHER’S NOTES at the beginning of the Do/Explore section.

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**INTRODUCTION**

**ENGAGE**

**SET THE STAGE**

**30 MINUTES**

**TEACHER’S NOTE:** Plan to have students work with a partner or small group for this activity.

Raise your hand if you have seen a carpenter or construction worker building a home or other building.

Do they have a plan for what they are building?
Yes.

**What is the plan called?** Hint: It starts with a color.
Blueprint

**Why do you think they need a blueprint plan?**
So several people can work together and know where to build the walls, add plumbing and electricity, etc.

**Could they build the structure without a blueprint?**
Maybe, but it may not turn out as it was intended, and there may be a lot of mistakes. It will probably take them longer, too.

Planting a garden is a bit like building a house. A good plan will make the job easier and will result in a productive garden.
What kind of help would a plan provide a gardener?

*Write the answers on the board.* A garden plan will:
- Help the gardener determine what kind of and how many plants or seeds to buy
- Assure the plants have plenty of room to grow
- Help determine what supplies and how much are needed
- Help a gardener determine how much produce to expect from the garden
- Help a gardener know when the crop will be ready to eat

**PLAN A GARDEN FROM A BOOK**

We are going to read *Too Many Pumpkins* by Linda White, a story about a woman who doesn’t plan what grows in her yard.

*Read the story, Too Many Pumpkins by Linda White, and ask the class the following questions:*

**Rebecca Estelle grew a little bit of everything in her garden except what?**
Pumpkins

**Why?**
She was tired of pumpkins because that is all she ate when she was young.

**Did Rebecca Estelle have a plan for her pumpkin patch?**
No, she didn’t intentionally plant the pumpkins.

**Did the pumpkins grow well?**
Yes, very well.

**What was the problem with the pumpkins?**
There were too many, and they took over the entire yard.

**How did she solve the problem?**
She made pumpkin treats and jack-o-lanterns and shared them with neighbors and friends.

**Do you think she will include pumpkins in her garden plan next year?**
Yes.

**How do you know?**
She saved some of the seeds.

Let’s plan Rebecca Estelle’s garden for next year. I am going to assign each of you a partner or group. Your group will have 5 to 7 minutes to plan Rebecca Estelle’s garden for next year.

*Assign partners or groups, distribute one Garden Grid per group. Have the students take out their pencils and rulers.*

**What vegetables did Rebecca Estelle plant in her garden?**
Let’s go back to the story and list the crops that Rebecca Estelle plants in her garden and add pumpkins. *(These are found on the first page of the story.)* “Every year at springtime, Rebecca
Estelle planted just enough seeds in her garden to grow vegetables for the long winter. She planted carrots, beans, tomatoes, peas, corn, and rutabagas. 

Please write these vegetables in the empty space on the right hand side of your garden grid. Work with each other to draw a plan for Rebecca’s garden on your garden grid. You may use any plan you would like but be sure to include all the vegetables on your plan. You will have 5 to 7 minutes. Do it any way you like. (Avoid telling students how to make their plan. Let them come up with their own garden plan as a pretest.)

It’s time to share your garden plans. How did your group do? Give each group 1 minute to show and tell about their garden plan, or use the “garden gallery” method by having students hold up their plans at the same time so everyone else can see. Ask them to look for similarities and differences.

What problems did you have while you were designing Rebecca’s garden?

Possible answers include:
- Couldn’t agree with partner
- Didn’t know how much space each plant needed in the garden
- Didn’t know how many plants we needed to grow
- Didn’t know how to use the garden grid
- What is a rutabaga anyway?

How could we figure out how to resolve these problems before we make our own garden plans?

Possible answers include:
- Use some of the good ideas from the plans we just made.
- Find people to help us who know what they are doing.
- Look at plant seed packages or plant labels.
- Do an online search for information on the crops.
- Look at someone else’s garden plan and garden.

Have the students put their names on their garden grids and collect them. Explain that they will be using them again.

**TEACHER’S NOTES:** Copy the Seed Catcher pattern and instructions found at the end of this lesson, one per student. See the Lettuce Wraps recipe in this section and the Fresh Garden Salsa recipe at the end of the lesson to purchase ingredients. Wash and precut samples and store them in bags. Save a whole lettuce leaf, spinach leaf, radish, and green onion to show the students and to demonstrate how to prepare or cut it. Invite a few students to help distribute the samples. You may want them to wear gloves or use tongs to put the samples on one paper plate per student.

**SEED CATCHERS**

Distribute the Seed Catcher patterns and have the students use their scissors to cut them out. Follow the instructions and make the seed catchers together, step by step. Give the students time to take turns using their new seed catchers and reading the tips about gardening.

What was your favorite gardening tip? Ask three or four students to share the tip from their seed catchers.
What did you learn by making and playing with your seed catchers?

Possible answers include:

• You have to follow step by step instructions before you can make the seed catcher work.
• There were lots of steps and decisions to make before you could read the garden tip.

They might repeat the tips.

What was the first decision you had to make to start playing with your seed catchers?

Someone had to choose a food that grows in a garden.

What was the first decision Rebecca made about gardening?

She chose what food she wanted to grow in her garden.

We will start our own garden plan by first deciding what we want to grow and eat.

GARDEN CHOICES THROUGH TASTE TESTING

Make sure that everyone washes their hands and that the demonstration table is washed. Set up the table with the ingredients (see Lettuce Wraps recipe), cutting board, knife, gloves or tongs, paper plates, paper towels, and napkins. Have the student volunteers put the paper plates out on the table so that they can place one sample of each vegetable on each plate. When the other students are done washing their hands, have them pick up their sample plates and take them back to their seats. Instruct them not to eat anything on their plate until they are told.

<table>
<thead>
<tr>
<th>LETTUCE WRAPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makes 24 samples</td>
</tr>
</tbody>
</table>

1. Wash all produce before starting.

2. Prepare the ingredients.

   * Save one of each vegetable to show to students before cutting.

   1 bundle of Romaine or leaf lettuce (enough for one leaf per student)
   12 large (tear in half) or 24 small spinach leaves
   6 radishes (slice thinly)
   6 green onions (slice the white part and 1 ½ inches of the green part into thin rings, discard the roots and the tops)
   Squirt bottle of ranch dressing

3. Have each student do the following.

   Lay the lettuce leaf in the center of the paper plate.
   Lay the spinach leaf or leaves on top of the lettuce leaf.
   Put the radish slices on the spinach.
   Put the onion slices on the radish slices.
   Squirt a line of ranch dressing across the layer of veggies. (Adult should help.)
   Roll up the wrap or fold one side over the other.

**EAT IT!**
COOL SEASON CROPS: LETTUCE WRAPS

We are going to make Lettuce Wraps so we can taste some early, cool season vegetables.

Why are some vegetables called “cool season crops”?
Possible answers from students could include:
• They are neat or awesome.
• They don’t like heat.
• They grow best when it’s cool outside.
• They like to be in the refrigerator.

Cool season crops grow best when they are planted outside as soon as the soil can be worked. These crops tend to dry up and die when hot summer weather arrives. If there is enough light, these crops could also be started or grown indoor containers. In the book we read, Rebecca’s garden did not have any of these crops because she was growing crops to save through the winter.

We are going to taste some cool season vegetables that grow near where we live and that we might be able to grow in our garden. I grew/bought these at _______________. I kept most of these in the refrigerator to keep them fresh until we needed them. Then I washed them and cut them into sample sizes. Before we make our lettuce wraps, let’s see if you can identify the vegetables on your plates.

Show one vegetable at a time. Start with the largest lettuce leaf. Have students tell what it is. Continue naming the other vegetables. As vegetables are identified, have students stack them on their lettuce leaf. Give each student a squirt of ranch dressing, if desired, then show how to roll everything up into their own Lettuce Wraps.

How did you like your Lettuce Wraps?

Raise your hand if you tried a vegetable that was new to you.

Have the students name the ingredients in the lettuce wraps. Write them on the board or a large sheet of paper, leaving space for tally marks. Have them vote for their top three favorite vegetables in the wraps. The most popular choices could be the cool season crops they grow in their garden.

WARM SEASON CROPS: SUMMER GARDEN SALSA

TEACHER’S NOTES: As time allows, you can continue with the warm season crops and salsa tasting or save this activity for another day. You need to allow 10 minutes extra if you make the Summer Garden Salsa recipe with your class. Students can cut ingredients on plastic plates using plastic knives. Mix ingredients in a large bowl or ice cream pail.

We are going to taste test some warm season crops.
Using what we learned about cool season crops, why might these foods be called warm season crops?
Possible student answers include:
• They like warm weather.
• They taste hot and spicy.
• They don’t grow well in cool weather.
• They grow best during warm weather.

Warm season crops thrive in warm, sunny summer weather. These crops could also be planted inside in containers, then transplanted outside when the temperatures warm up. Some local producers are planting warm season crops in greenhouse-type buildings, called high tunnels, so their crops will be ready to eat earlier. Consumers enjoy eating summer vegetables early because they have waited a long time for the vine-ripened, just-picked flavor.

Fresh garden salsa contains many warm season vegetables that we could grow. The garden salsa we are testing was made or purchased at ____________________. I will put a serving of salsa and some chips on each of your plates. Then you can taste it.

Raise your hand if you have eaten fresh salsa that is usually sold and stored in a cooler or refrigerator.

Raise your hand if you have eaten processed salsa that is usually found in a jar on a shelf until it is opened and then stored in a refrigerator.

Is it one of your favorite foods?
More salsa is consumed in the United States than ketchup.

What are the ingredients in our fresh salsa?
We can read the ingredient label or the ingredient list on the recipe. Let’s look at each ingredient and add them to the list of warm season crops from Rebecca’s garden in “Too Many Pumpkins.”

Show uncut examples of each vegetable in the salsa. You may want to cut up small samples to taste. List the vegetables from the salsa and the “Too Many Pumpkins” book on the board or a large sheet of paper. Have the students vote for their top three choices. Put a star by the three to six crops that received the most votes. These are the crops they could plant in their garden.

Which vegetables had the most votes?
Which ones had less?

Class could make a bar graph plotting the results of the tally voting.

We will want to remember our favorites when we plant our garden. It is also important to plant a variety of crops so we can harvest in spring, summer, and fall.
TEACHER’S NOTES:

- Select the Garden Grid, found at the end of this lesson, that best suits the type of garden you will grow – tilled, raised bed, or container such as EarthBox™. Copy one per student or pairs of students and one or two as working copies for the entire class. Have the same pairs or small groups of students that worked on Rebecca’s garden from the Introduction section work together on these garden plans.
- Everyone will need to see the list of crops that they chose to plant from the Do/Explore section and the Cool and Warm Season Crops Guide found at the end of this lesson. They will also need to see the “Plant Spacing for Rows in the Garden” and the “Plant Spacing for Square Foot Gardening” charts found at the end of this lesson. Use poster board to prepare an example of each of the square-foot garden templates found at the end of the lesson.
- It would be best if students measure the actual gardens they will be planting. If not, have the measurements available.
- With help from garden experts in your community such as extension master gardeners, local producers, garden store employees, and local gardeners such as parents and grandparents, use the list of crops you want to grow and discuss what varieties are their favorites and how much they typically harvest from the crops on the list. Although you can find the information you need online, you miss the connection with the community and their local experiences growing fruits and vegetables.

Now that we have identified what we want to grow in our garden, we are going to make a plan.

Redistribute the Garden Grids with another copy of the 10’ x 15’ grid or the raised bed and container gardens on the back of the sheet. Have the students write the crops they will be planting in the margins of the new grids.

Take another look at your plans for Rebecca’s garden and think about what you learned about the fruits or vegetables we want to plant in our garden.

**What information do you think you need to help you make new plans for our actual garden?**

**Discuss answers with your partner or group and be ready to share them with the rest of us.**

Give them 3 minutes for discussion then have each group share one thing they need to know. Have all the students raise their hands if they feel that information would also help them. Then write it on the board. Possible answers include:

- How many plants will we need?
- How much space do we have?
- How big will the plants grow?
- How do you arrange the crops in the garden – rows, sections, mounds or small hills, etc.?
- Could we grow an early crop, harvest it, and then plant something else in the same spot?

Let’s start with finding out how much space we have in our garden.

Look at the Garden Grid and note how each square equals 1 square foot. Measure 1 square foot on the floor as an example of what it will be in the garden.

**How many feet long is the garden grid?**

*The length of the garden grid depends on which one you will be using. The large grid is 15 feet, the raised bed is 4 feet, and each container has 14 inches of space to plant things.*

**How many feet wide is the garden grid?**

*The width of the garden depends on which one you will be using. The large grid is 10 feet, the raised bed is 8 feet, and each container has 29 inches of space to plant things.*
Use one copy of the appropriate garden grid and work with the students to identify the type and sizes of the gardens they will be planning and growing. If possible, measure your actual gardens and make sure the grids will work for your plans.

**NUMBER OF PLANTS**

Unless you have large gardens, you probably won’t have enough room to grow large amounts of crops for the students and their families. You may want to help them figure out how many plants they will need for everyone to have a sample. Encourage them to grow more at home or in a community or neighborhood garden.

Discuss each of the crops you will be planting. Students, Master Gardeners, and other experienced gardeners can provide their knowledge and experiences to figure out how many fruits or vegetables come from one plant. Upon consensus from the group, record the numbers of the plants you will need next to the crops on the main list and have the pairs or groups write them next to the crops on their garden grids.

**AMOUNT OF SPACE PER PLANT**

If you are using large container or raised bed gardens, you will want to use the Plant Spacing for “Square-foot Gardening” chart. If you are using a traditional tilled garden in the ground, you will want to use the “Plant Spacing for Rows in the Garden” chart. Both charts are found at the end of the lesson. When talking about square-foot gardening, show the square-foot gardening guides made from the templates found at the end of the lesson.

Work together and use the charts to mark the plants on the garden grid. You may use dots and label them or draw a picture of the fruit or vegetable to mark them on the grid. Point out that the squares on the chart are the same as the squares on the garden grid; they both represent 1-foot squares. Leave 1 foot between rows or follow the space guides on the row guide. Square-foot gardens are planted with square-foot grids. Raised bed gardens are usually planted in square feet and don’t require walkways because gardeners are working from outside the bed. If the plants you chose do not appear on the grid, help the students to find a plant on the chart that grows similarly to the missing one and requires about the same amount of space in the garden. Refer to the sample Raised Bed Garden Plan and Tilled Garden Plan for help in planning your garden using the garden grids.

**OPPORTUNITY TO DOUBLE CROP**

Using the Cool and Warm Season Crop guides at the end of the lesson and what the students learned about the cool and warm season crops they tasted, discuss how to expand the use of your garden by double cropping. Put a “C/F” for “cool” and “fast” in front of the crops you chose that can be harvested in time to use the space for another crop to grow. In some locations you can grow cool, then warm, then more cool season crops during the same gardening season.

**CREATE GARDEN PLANS**

Creating a garden plan is similar to putting a puzzle together. The pieces of the puzzle are the crops that you want to plant in the garden. Be sure you start lightly with pencil so that you can erase. You may want to display the Sample Raised Bed Garden Plan and Tilled Garden Plan, found at the end of this lesson.
If you use dots to represent plants, you will have to label them with the name of the crop written nearby. If you can draw a picture of the fruit or vegetable to represent each plant, you don’t have to label them. You can use both dots and labels and pictures depending on how much space you have.

Allow 10 minutes for this activity and walk around to offer help. If they aren’t completely done after 10 minutes, assure them that everyone will help each other to come up with the best plan.

Select a group of students who believe they have figured out the garden plan or puzzle using all the crops. Have them show their plan to the rest of the group. Compare their garden plan with others. Identify the best qualities of the students’ plans. Combine those qualities together on a new garden grid to use when the students mark and plant their real garden.

TEACHER’S NOTES:

1. Prepare garden labels ahead of time. If you are using vinyl blind slats, use heavy scissors to cut vinyl blind slats into 8 to 10 inch sections. Cut points at one end of the blind slats and paint sticks. Each garden row or section of square-foot gardening space will need two garden labels. Write crop names on paper strips and place them in a bowl or envelope so students can draw out their crop. For example, if you are planting lettuce, you should write lettuce on two strips of paper.

2. In the upper left hand corner of each day on the Garden Calendar, write the date. You may want to do that on just the months when you will be planning, planting, maintaining, and harvesting your garden. Everyone will be working together to mark significant gardening dates on the calendar, so enlarge it on the wall or larger sheets of paper.

3. You may want to show examples of commercially available garden calendars from the Internet or from your local extension office or garden store.

GARDEN LABELS

Now that we have our garden puzzle/plan put together, we need to make garden labels for each crop.

Why do we need garden labels for our garden?

- So we remember what we planted.
- So we can show people where each crop is located if we don’t have our garden plan.

How many garden labels will we need for each row or section?

Two – one at each end of the row or two per section

Distribute garden markers, one per student, depending on the number of crops. Each student will also need a thin line permanent marker.

I have given each of you sticks to make garden markers. Will these be good for outdoor use?

Yes.

Why?

Wood is somewhat waterproof and plastic is very waterproof.
What did I make at one end of each stick to help us push it into the ground?
Points

I will walk around and let each of you draw out a name of a fruit or vegetable crop for your garden label.

Using permanent markers, draw a picture of your fruit or vegetable at the top of the label (not the pointed end) and then neatly print the crop name below the picture. *(If you are using wooden spoons, draw on one side of the spoon and print the name on the other side.)*

Why did I give you permanent markers?
Because the plant labels will get wet and the names could wash off if the marker isn’t permanent.

Collect the garden labels and keep them until planting day.

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**GARDEN CALENDAR**

Project or display the Garden Calendar so that everyone can work with it. Show examples of garden calendars and have students read the activities, planting dates for the different crops, tips for maintenance, and harvest dates that are written on the calendar. Use your seed packets, planting guides, the Dool and Warm Season Crops guide found at the end of this lesson, or help from local garden experts to start writing dates about your garden on the master Garden Calendar. Throughout the planting season, the class can write gardening tips in the calendar squares. This would be a good whole group activity once a week. Log items like planting dates, weeding times, watering days, harvesting, weather, temps, and tasting. If students have gardeners in their families, they might get fun garden tips from them to add to their calendar pages.

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**SHARING YOUR ABILITY TO CREATE GARDEN PLANS**

Where can you use your new garden planning knowledge and skills?

Possible answers include:

- For a garden next year
- At home
- Neighborhood or community garden
- Help with gardens at community centers, senior living homes, residential facilities, etc.
- To write up the steps and put it in your school news, in a local newspaper, etc.
- To share with beginning gardeners
Garden Grid

4' x 8' RAISED GARDEN

0 1 2 3 4 5 6 7 8

1 square foot

15" x 30" EARTHBOX™ CONTAINER GARDENS

14" 29"
1. Cut along the solid dark lines and place face down.
2. Fold the square in half diagonally, corner to corner, to form a triangle. Crease the fold firmly. Unfold and repeat in the opposite direction to leave an “X” fold through the center.
3. Fold each corner point into the center of the “X” to form a smaller square.
4. Flip the square over so you don’t see any of the cut edges and fold each corner into the center of the “X” to form a smaller square.
5. Fold the square in half to form a rectangle. Unfold and repeat the process the other direction.
6. Put your thumbs and first or index fingers into the four pockets left by your folds. Try moving your fingers to move the four pockets in two directions.
7. Ask someone to select one of the four garden crops on the pockets. Move the seed catcher back and forth as you spell out the crop. Ask them to choose a number. Move the seed catcher back and forth as you count out the number. Ask them to choose another number. Take your fingers out of the seed catcher, open the flap, and read the garden tip under the number they chose.

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**SEED CATCHER**

1. Plant zucchini seeds outdoors at the right time because the soil has to be warm enough for the seeds to grow.

2. Tomatoes can be planted three ways: seeds, small green plants, small dry “sets.”

3. Two cherry tomato plants will produce hundreds of tomatoes!

4. Don’t plant seeds too deep or they won’t grow.

Pumpkins take four months to grow - plant seeds in May.

Plant four cucumber seeds in each hill: “One for the cutworm, one for the crow, one for the ground squirrel, and one to grow!”

One zucchini plant will produce all the zucchini you will need!

Peas

The Native American Three Sisters Garden contains: beans, corn, and squash.

Grow in the Garden: Local Foods and Healthy Living
Lesson 4b  Our Healthy Garden Plan

Grade 5-6 Lesson 5 January 29
**FRESH GARDEN SALSA**

4 to 5 large tomatoes, seeded and coarsely chopped
1 small fresh jalapeno chile, seeded and minced *(optional)*
1 clove garlic, minced
1/4 cup finely chopped onions
2 tablespoons finely chopped cilantro
2 tomatillos, husks removed, finely chopped *(optional)*
Juice from 1 small lime
1/4 teaspoon salt
1/4 teaspoon freshly ground black pepper

In a large bowl, combine all the ingredients. Stir together until well blended.

Cover and chill for 30 minutes or more before serving.

Keeps for up to 4 days in the refrigerator.

Makes about 2 cups.

© Copyright 2012 Iowa State University
1. Make a copy of this page.
2. Cut around the 4-inch squares and cut out the circles.
3. Place one template on one corner of a poster board.
   Draw around the outside of the square and around the circles.
4. Use the same template four times to make a square-foot gardening guide.
5. Cut around the square foot and cut out the circles.
6. Write the names of the crops in the center of the guide.
7. It is best to laminate these guides to keep them in good shape from year to year.
# PLANT SPACING FOR SQUARE-FOOT GARDENING

Use the following key to plan how much space plants need when they are planted in squares.

<table>
<thead>
<tr>
<th>CROP</th>
<th>NUMBER OF PLANTS in each square</th>
<th>OR NUMBER OF SQUARES for each plant</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>onions</td>
<td>16</td>
<td></td>
<td><img src="image" alt="onions" /></td>
</tr>
<tr>
<td>lettuce</td>
<td>16</td>
<td></td>
<td><img src="image" alt="lettuce" /></td>
</tr>
<tr>
<td>spinach</td>
<td>16</td>
<td></td>
<td><img src="image" alt="spinach" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>peas</td>
<td>9</td>
<td></td>
<td><img src="image" alt="peas" /></td>
</tr>
<tr>
<td>cauliflower</td>
<td>4</td>
<td></td>
<td><img src="image" alt="cauliflower" /></td>
</tr>
<tr>
<td>cabbage</td>
<td>4</td>
<td></td>
<td><img src="image" alt="cabbage" /></td>
</tr>
<tr>
<td>broccoli</td>
<td>4</td>
<td></td>
<td><img src="image" alt="broccoli" /></td>
</tr>
<tr>
<td>radishes</td>
<td>16</td>
<td></td>
<td><img src="image" alt="radishes" /></td>
</tr>
<tr>
<td>carrots</td>
<td>16</td>
<td></td>
<td><img src="image" alt="carrots" /></td>
</tr>
<tr>
<td>sweet corn</td>
<td>1</td>
<td></td>
<td><img src="image" alt="sweet corn" /> (must be planted in a block at least 10' x 5' for good pollination)</td>
</tr>
<tr>
<td>potatoes</td>
<td>2</td>
<td></td>
<td><img src="image" alt="potatoes" /></td>
</tr>
<tr>
<td>zucchini</td>
<td>9</td>
<td></td>
<td><img src="image" alt="zucchini" /></td>
</tr>
<tr>
<td>squash</td>
<td>9</td>
<td></td>
<td><img src="image" alt="squash" /></td>
</tr>
<tr>
<td>pumpkins</td>
<td>9</td>
<td></td>
<td><img src="image" alt="pumpkins" /></td>
</tr>
<tr>
<td>bush beans</td>
<td>9</td>
<td></td>
<td><img src="image" alt="bush beans" /></td>
</tr>
<tr>
<td>peppers</td>
<td>1½</td>
<td></td>
<td><img src="image" alt="peppers" /></td>
</tr>
<tr>
<td>tomatoes</td>
<td>9</td>
<td></td>
<td><img src="image" alt="tomatoes" /></td>
</tr>
<tr>
<td>cucumbers</td>
<td>9</td>
<td></td>
<td><img src="image" alt="cucumbers" /></td>
</tr>
</tbody>
</table>
**PLANT SPACING FOR GARDEN ROWS**

The following key will help you plan how much space your crops will need in rows and between rows. Use a string stretched along the row as a guide to make straight rows.

\[
\text{———} = 1 \text{ foot}
\]

Example of onions set 3” apart in a 1 foot row on a garden grid

<table>
<thead>
<tr>
<th>Crops</th>
<th>EARLY PLANTING</th>
<th>MID-MAY PLANTING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spacing between plants</td>
<td>Spacing between rows</td>
</tr>
<tr>
<td>onions</td>
<td>3”</td>
<td>1 foot</td>
</tr>
<tr>
<td>sets or plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lettuce</td>
<td>Thin to 2”</td>
<td>1 foot</td>
</tr>
<tr>
<td>seeds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>peas</td>
<td>3”</td>
<td>2 feet</td>
</tr>
<tr>
<td>seeds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>broccoli / cabbage</td>
<td>18”</td>
<td>2 feet</td>
</tr>
<tr>
<td>cauliflower plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>radishes</td>
<td>Thin to 2”</td>
<td>1 foot</td>
</tr>
<tr>
<td>seeds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>carrots</td>
<td>Thin to 1”-1½”</td>
<td>1 foot</td>
</tr>
<tr>
<td>seeds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sweet corn</td>
<td>6”-8”</td>
<td>2 feet</td>
</tr>
<tr>
<td>seeds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>beets</td>
<td>Thin to 1”-1½”</td>
<td>1 foot</td>
</tr>
<tr>
<td>JANUARY</td>
<td>FEBRUARY</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>SUN</td>
<td>MON</td>
<td>TUE</td>
</tr>
<tr>
<td>SUN</td>
<td>MON</td>
<td>TUE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MARCH</th>
<th>APRIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUN</td>
<td>MON</td>
</tr>
<tr>
<td>SUN</td>
<td>MON</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MAY</th>
<th>JUNE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUN</td>
<td>MON</td>
</tr>
<tr>
<td>SUN</td>
<td>MON</td>
</tr>
</tbody>
</table>
## COOL AND WARM SEASON CROPS

### COOL SEASON CROPS*

<table>
<thead>
<tr>
<th>VEGETABLE</th>
<th>DAYS TO HARVEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beets</td>
<td>60 - 80</td>
</tr>
<tr>
<td>Broccoli (transplants)</td>
<td>60 - 80</td>
</tr>
<tr>
<td>Carrots</td>
<td>60 - 80</td>
</tr>
<tr>
<td>Cabbage (transplants)</td>
<td>60 - 80</td>
</tr>
<tr>
<td>Cauliflower (transplants)</td>
<td>60 - 80</td>
</tr>
<tr>
<td>Collards</td>
<td>50 - 60</td>
</tr>
<tr>
<td>Kale</td>
<td>50 - 60</td>
</tr>
<tr>
<td>Kohlrabi</td>
<td>50 - 60</td>
</tr>
<tr>
<td>Lettuce</td>
<td>30 - 40</td>
</tr>
<tr>
<td>Mustard greens</td>
<td>40 - 60</td>
</tr>
<tr>
<td>Green onions (sets or transplants)</td>
<td>35 - 45</td>
</tr>
<tr>
<td>Peas</td>
<td>50 - 75</td>
</tr>
<tr>
<td>Potatoes</td>
<td>110</td>
</tr>
<tr>
<td>Radish</td>
<td>30 - 35</td>
</tr>
<tr>
<td>Spinach</td>
<td>35 - 40</td>
</tr>
</tbody>
</table>

*These cool season crops can be planted as soon as the soil can be worked in early spring and some can be harvested before school dismisses in May or June. Plan to harvest some of these crops a week or two before school is out so that you can plant warm season crops that will be ready for harvest when the students return to school in August or September. To determine if you have enough time to harvest a crop from your garden, count backward on the calendar from a potential harvest date. If possible, plant early maturing varieties.

### LATE SUMMER PLANTING

The cool season crops listed above, except for potatoes, can also be grown successfully in the fall. Plant the broccoli, cabbage, cauliflower, and kale so that they mature around the average first frost date in your area; count back from that date for the appropriate planting time. Wait until the daytime temperatures average no higher than 80 and the evening temperatures are in the 60s or below.

### WARM SEASON CROPS*

<table>
<thead>
<tr>
<th>VEGETABLE</th>
<th>DAYS TO HARVEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snap beans</td>
<td>50 - 60</td>
</tr>
<tr>
<td>Sweet corn</td>
<td>65 - 110</td>
</tr>
<tr>
<td>Cucumbers</td>
<td>50 - 70</td>
</tr>
<tr>
<td>Eggplant</td>
<td>75 - 80</td>
</tr>
<tr>
<td>Muskmelon or cantaloupe</td>
<td>90 - 120</td>
</tr>
<tr>
<td>Onions, dry (sets or transplants)</td>
<td>90</td>
</tr>
<tr>
<td>Okra</td>
<td>70 - 90</td>
</tr>
<tr>
<td>Peppers</td>
<td>70 - 75</td>
</tr>
<tr>
<td>Sweet potatoes</td>
<td>140 - 150</td>
</tr>
<tr>
<td>Pumpkins</td>
<td>90 - 120</td>
</tr>
<tr>
<td>Summer squash and zucchini</td>
<td>60 - 75</td>
</tr>
<tr>
<td>Winter squash</td>
<td>90 - 120</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>70 - 80</td>
</tr>
<tr>
<td>Tomatillos</td>
<td>70 - 80</td>
</tr>
<tr>
<td>Watermelon</td>
<td>85 - 120</td>
</tr>
</tbody>
</table>

*Warm season crops are planted after the threat of frost is past in the spring. For most parts of the country, they will not be ready to harvest until after school has dismissed for summer. However, if you plant it just before summer recess or a few weeks later, they will be ready for harvest when the students return and later into the fall. You may want to count back from the day school begins to determine the optimum planting time. Remember, if you plant these crops to grow through the summer, you will need someone to be responsible for the general care and watering of the garden.
Lesson Six: Mulching for Water Conservation and Cabbage

For February

“Mulching for Water Conservation” from KIDS COOK FARM FRESH FOOD, California State Department of Education and “Cabbage” from HARVEST OF THE MONTH: Network for a Healthy California.

Students learn about dry-land farming, and how it might apply to their garden. They conduct an evaporation experiment and study how mulching helps water conservation. They decide how to mulch their garden space. This multi-part lesson includes many activities about cabbage. They learn about acid-base properties, cruciferous vegetables, nutrients in cabbage, growing cabbage, and conduct experiments.

Content objectives:
- Describe the role of mulch in conserving waters; determine evaporation with and without mulch; describe how cabbage grows; discuss nutrients in cruciferous vegetables; investigate acid-base properties of cabbage.

Life Skill objectives:
- Healthy lifestyle choices, Critical thinking, Communication, Citizenship, Leadership, Decision making, Problem solving,

Core and STEM concepts and skills:
- Science: Science as inquiry, Earth and space, Life science
- Math: Operations and algebraic thinking, Numbers, Measurement and Data, Geometry, Mathematical practices
- Language Arts: Reading, Speaking, Listening, Viewing
- Social Studies: Economics, Geography

Healthy snack: Cabbage Confetti

Additional and supporting resources:
Cooperative Extension Master Gardener’s Program can be a resource for developing your garden plan.
LESSON PLANS FOR 2012-13 SCHOOL YEAR, GRADE 5

February: Mulching for Water Conservation and Cabbage

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  Healthy Gardens, Healthy Youth

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  Harvest of the Month, Network for a Healthy California

Recipe: Cabbage tasting and/or Cabbage Confetti (included in Harvest of the Month)
BEFORE THE LESSON
Cabbage is a popular winter vegetable. Thanks to the Network for a Healthy California Harvest of the Month [www.harvestofthemonth.cdph.ca.gov](http://www.harvestofthemonth.cdph.ca.gov) website, we are sharing educator newsletters that included information, recipes, and activities about cabbage.

1. **Grade 5, February: Mulching and Cabbage 2012-2013 School Year**
   This document contains all the curriculum items and resources you need for this lesson. All lesson downloads are located on the [www.peoplesgarden.wsu.edu](http://www.peoplesgarden.wsu.edu) Educational Toolkit.

2. **Mulch Activities**
   Gather the materials for the Mulching for Water Conservation activity. Read the Mulching for Water Conservation Educator’s Guide and the activity to prepare for the lesson.

3. **Food Safety**
   The [FIGHT BAC: Six Steps to Safer Fruits and Vegetables](http://www.partnershipforfoodsafety.org/brochures/fightbac/sixsteps) brochure from Partnership for the Food Safety Education is included here. This information was also provided in the November lesson. The brochure focuses on tips to keep fruits and vegetables safe to eat and to prevent foodborne illness.
   
   [FIGHT BAC: Four Simple Steps to Food Safety](http://www.extension.ndsu.edu/) is a brochure from North Dakota State University Extension Service that lists tips to clean, separate, cook, and chill food, including fruits and vegetables, to prevent foodborne illness.

   Did you make a poster for the November lesson? If so, be sure to post it. If not, you might want to make a simple poster to display in the classroom to remind everyone that about these simple food safety steps. Go over the relevant steps before starting any food preparation or tasting in the lesson.

4. **Harvest of the Month: Cabbage**
   Review Harvest of the Month: Cabbage educators newsletter. Gather the materials and related documents to prepare for the nutrition lesson.

5. **Garden Journals**
   Continue your garden journals or records. Have student do make a three-column KWL (know, would like to know and learned) chart, and complete it for the journal. Each time you do a lesson or go out in the garden there is an opportunity to add something new to the Garden Journal.

6. **Taste testing**
   Prepare to do the Cabbage Tasting and/or make the Cabbage Confetti for tasting.
THE LESSONS

*Special note:* We recommend doing the Mulching for Water Conservation and Cabbage lessons on separate days or multiple days according to your schedule.

1. **Garden Lesson: The Magic of Mulch** Use the Educator’s Guide, do The Magic of Mulch activity, and refer to the ‘Mulching for Water Conservation’ to develop a plan about mulching the students’ gardens. This is a combination of STEM activities.

2. **Nutrition Lesson: Cabbage**
A suggested lesson design is included just before the lesson resources from *Harvest of the Month: Cabbage*. You may want to expand the lesson by choosing other activities from Harvest of the Month: Cabbage.

AFTER THE LESSON

1. Help the students follow through with their garden mulching plans.

2. Please complete the Garden Records sheets for the research component of this project and deliver it to your local extension educator or leader. Check with your local Extension Educator if you need a copy of the record.
Be a BAC Fighter

Make the meals and snacks from your kitchen as safe as possible. **CLEAN:** wash hands and surfaces often; **SEPARATE:** don't cross-contaminate; **COOK:** to proper temperatures, and **CHILL:** refrigerate promptly. Be a BAC Fighter and **Fight BAC!**

---

**SAFE COOKING TEMPERATURES**

*as measured with a food thermometer*

<table>
<thead>
<tr>
<th>Ground Meat and Meat Mixtures</th>
<th>Internal temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef, Veal, Lamb, Pork</td>
<td>160°F</td>
</tr>
<tr>
<td>Chicken, Turkey</td>
<td>165°F</td>
</tr>
<tr>
<td><strong>Fresh Beef, Veal, Lamb</strong></td>
<td></td>
</tr>
<tr>
<td>Medium-rare</td>
<td>145°F*</td>
</tr>
<tr>
<td>Medium</td>
<td>160°F</td>
</tr>
<tr>
<td>Well-done</td>
<td>170°F</td>
</tr>
<tr>
<td>Poultry</td>
<td></td>
</tr>
<tr>
<td>Chicken and Turkey, whole</td>
<td>165°F</td>
</tr>
<tr>
<td>Poultry Parts</td>
<td>165°F</td>
</tr>
<tr>
<td>Duck and Goose</td>
<td>165°F</td>
</tr>
<tr>
<td>Stuffing (cooked alone or in bird)</td>
<td>165°F</td>
</tr>
<tr>
<td><strong>Fresh Pork</strong></td>
<td></td>
</tr>
<tr>
<td>Medium-rare</td>
<td>145°F*</td>
</tr>
<tr>
<td>Medium</td>
<td>160°F</td>
</tr>
<tr>
<td>Well-done</td>
<td>170°F</td>
</tr>
<tr>
<td><strong>Ham</strong></td>
<td></td>
</tr>
<tr>
<td>fresh (raw)</td>
<td>160°F</td>
</tr>
<tr>
<td>precooked (to reheat)</td>
<td>140°F</td>
</tr>
<tr>
<td><strong>Eggs and Egg Dishes</strong></td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td>Cook until yolk and white are firm</td>
</tr>
<tr>
<td>Egg Dishes</td>
<td>160°F</td>
</tr>
<tr>
<td><strong>Seafood</strong></td>
<td></td>
</tr>
<tr>
<td>Fin fish</td>
<td>145°F</td>
</tr>
<tr>
<td>Shrimp, lobster and crayfish</td>
<td>flesh is opaque and separates easily with fork</td>
</tr>
<tr>
<td>Clams, oysters and mussels</td>
<td>shells open during cooking</td>
</tr>
<tr>
<td>Scallops</td>
<td>milky white or opaque and firm</td>
</tr>
<tr>
<td><strong>Leftovers and Casseroles</strong></td>
<td>165°F</td>
</tr>
</tbody>
</table>

*Allow three-minute rest time

---

**Cooking food to the proper temperature kills harmful bacteria. So **Fight BAC!** by thoroughly cooking your food as follows:**

---

**For More Information about Safe Food Handling and Preparation**

USDA's Meat and Poultry Hotline 1-888-MPHotline (1-888-674-6854);
TTY 1-800-256-7072

www.foodsafety.gov

FDA's Food Information and Seafood Hotline 1-800-332-4010

Partnership for Food Safety Education Web Site www.fightbac.org

NDSU Extension Service www.ag.ndsu.edu/food

Or contact your local cooperative extension office.

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The US food supply is among the safest in the world, but organisms that you can’t see, smell or taste – bacteria, viruses and tiny parasites – are everywhere in the environment. These microorganisms – called pathogens – can invade food and cause illness, sometimes severe and even life-threatening, especially in young children, older adults, persons with weakened immune systems and pregnant women.

Fresh fruits and vegetables are important to the health and well-being of Americans and we enjoy one of the safest supplies of fresh produce in the world. However, although low, the proportion of foodborne illness associated with fresh fruits and vegetables has increased over the last several years. As health and nutrition experts continue to recommend we add more fruits and vegetables to a healthy daily diet, it becomes increasingly important that consumers know how to handle them properly.

Handling fruits and vegetables safely is easy. Although an invisible enemy may be in your kitchen, by practicing the following recommendations you can Fight BAC!®

These messages were developed by the Partnership for Food Safety Education. The Partnership for Food Safety Education unites industry associations, consumer and public health groups and the United States Department of Agriculture, the Environmental Protection Agency and from the Department of Health and Human Services, the Centers for Disease Control and Prevention and the Food and Drug Administration, to educate the public about safe food handling and preparation. The Partnership, a non-profit organization, is the creator and steward of the Fight BAC!® campaign, a food safety education program developed using scientifically based recommendations and resulting from an extensive consumer research process. Fight BAC!® materials are fully accessible online at www.fightbac.org and utilized by consumers, teachers, dietitians, public health officials and extension agents across the United States. Fight BAC!® and BAC! images, © 2004, Partnership for Food Safety Education.

This material made available with support from the Produce Marketing Association. For produce education information and tools, general food safety information and to register to be a BAC!® fighter, visit www.fightbac.org today! For additional food safety information, visit www.foodsafety.gov.
Safe Handling of Fresh Fruits and Vegetables

Check
- Check to be sure that the fresh fruits and vegetables you buy are not bruised or damaged.
- Check that fresh cut fruits and vegetables like packaged salads and precut melons are refrigerated at the store before buying. Do not buy fresh cut items that are not refrigerated.

Clean
- Wash hands with warm water and soap for at least 20 seconds before and after handling fresh fruits and vegetables.
- Clean all surfaces and utensils with hot water and soap, including cutting boards, counter tops, peelers and knives that will touch fresh fruits or vegetables before and after food preparation.
- Rinse fresh fruits and vegetables under running tap water, including those with skins and rinds that are not eaten. Packaged fruits and vegetables labeled “ready-to-eat”, “washed” or “triple washed” need not be washed.
- Rub firm-skin fruits and vegetables under running tap water or scrub with a clean vegetable brush while rinsing with running tap water.
- Dry fruits and vegetables with a clean cloth towel or paper towel.
- Never use detergent or bleach to wash fresh fruits or vegetables. These products are not intended for consumption.

Separate
- When shopping, be sure fresh fruits and vegetables are separated from household chemicals and raw foods such as meat, poultry and seafood in your cart and in bags at checkout.
- Keep fresh fruits and vegetables separate from raw meat, poultry or seafood in your refrigerator.

Separate fresh fruits and vegetables from raw meat, poultry and seafood. Do not use the same cutting board without cleaning with hot water and soap before and after preparing fresh fruits and vegetables.

Cook
- Cook or throw away fruits or vegetables that have touched raw meat, poultry, seafood or their juices.

Chill
- Refrigerate all cut, peeled or cooked fresh fruits and vegetables within two hours.

Throw Away
- Throw away fresh fruits and vegetables that have not been refrigerated within two hours of cutting, peeling or cooking.
- Remove and throw away bruised or damaged portions of fruits and vegetables when preparing to cook them or before eating them raw.
- Throw away any fruit or vegetable that will not be cooked if it has touched raw meat, poultry or seafood.
- If in doubt, throw it out!
SEPARATE: Don’t cross-contaminate

Cross-contamination is how bacteria can be spread. When handling raw meat, poultry, seafood and eggs, keep these foods and their juices away from ready-to-eat foods. Always start with a clean scene—wash hands with warm water and soap. Wash cutting boards, dishes, countertops and utensils with hot soapy water.

- Separate raw meat, poultry, seafood and eggs from other foods in your grocery shopping cart, grocery bags and in your refrigerator.
- Use one cutting board for fresh produce and a separate one for raw meat, poultry and seafood.
- Never place cooked food on a plate that previously held raw meat, poultry, seafood or eggs.

COOK: Cook to proper temperatures

Food is safely cooked when it reaches a high enough internal temperature to kill the harmful bacteria that cause illness. Refer to the chart on the back of this brochure for the proper internal temperatures.

- Use a food thermometer to measure the internal temperature of cooked foods. Make sure that meat, poultry, egg dishes, casseroles and other foods are cooked to the internal temperature shown in the chart on the back of this brochure.
- Cook ground meat or ground poultry until it reaches a safe internal temperature. Color is not a reliable indicator of doneness.
- Cook eggs until the yolk and white are firm. Only use recipes in which eggs are cooked or heated thoroughly.
- When cooking in a microwave oven, cover food, stir and rotate for even cooking. Food is done when it reaches the internal temperature shown on the back of this brochure.

- Bring sauces, soups and gravy to a boil when reheating.

CHILL: Refrigerate promptly

Refrigerate foods quickly because cold temperatures slow the growth of harmful bacteria. Do not over-stuff the refrigerator. Cold air must circulate to help keep food safe. Keeping a constant refrigerator temperature of 40°F or below is one of the most effective ways to reduce the risk of foodborne illness. Use an appliance thermometer to be sure the temperature is consistently 40°F or below. The freezer temperature should be 0°F or below.

- Refrigerate or freeze meat, poultry, eggs and other perishables as soon as you get them home from the store.
- Never let raw meat, poultry, eggs, cooked food or cut fresh fruits or vegetables sit at room temperature more than two hours before putting them in the refrigerator or freezer (one hour when the temperature is above 90°F).
- Never defrost food at room temperature. Food must be kept at a safe temperature during thawing. There are three safe ways to defrost food: in the refrigerator, in cold water, and in the microwave. Food thawed in cold water or in the microwave should be cooked immediately.
- Always marinate food in the refrigerator.
- Divide large amounts of leftovers into shallow containers for quicker cooling in the refrigerator.
- Use or discard refrigerated food on a regular basis. Check USDA cold storage information at www.fightbac.org for optimum storage times.
Educator’s Guide
Mulching for Water Conservation
Healthy Gardens, Healthy Youth

Here are some recommendations for doing the Mulching for Water Conservation activities and helping the students to apply what they learned to their garden.

1. On a screen, project the Springhill Farm, Farm Profile and read it together.

2. Modify numbers 1. and 2. under “Doing the Activity” as follows:

   a.) Ask students to share any surprises and new things they learned from the story.

   b.) Have the students describe what is needed and how to dry-farm potatoes.

   c.) Ask the students what mulch is, what it is for, and how they might use it for dry-farming for their school gardens.

   d.) Read the first three paragraphs in the Background section and add this sentence from “Doing the Activity” number 2: “Farmers and gardeners use mulch to conserve water, to reduce the number of weeds, and to prevent soil from washing away.”

3. Conduct the evaporation comparison experiment as described under “Doing the Activity” numbers 3 through 8. You may want to have the student groups write down predictions or create hypotheses for the experiment. They can write their findings and conclusions after the experiment.

4. After the experiment, lead a discussion about whether or not it would be a good idea to mulch their gardens and or walkways and why. You may want to review the main reasons to mulch. If you are using the square foot gardening method, it is not necessary to mulch. If you are using raised beds, mulching around the outside of the beds is a good idea. Discuss the reasons why with your students. Their answers may include: the mulch will hold the water in the soil and hold the soil in place (think about mud puddles with lots of traffic around the garden beds); mulch is easier to maintain than mowing grass and trimming close to the frames of the raised beds; the grass may get trampled and the walkways could turn to mud puddles; mulch will help to prevent weeds – especially if there is landscape fabric underneath it.

5. Discuss what types of mulch would be appropriate for the students’ gardens. Use the following chart to test other types of mulch and to determine what might work best. You may also want to ask Extension Master Gardeners, local garden experts, or check on the internet for tips about types of mulch and how much you will need.
### Mulch Depth

<table>
<thead>
<tr>
<th>Mulch</th>
<th>Depth</th>
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</thead>
<tbody>
<tr>
<td>Dried grass clippings</td>
<td>3 to 4</td>
</tr>
<tr>
<td>Sawdust</td>
<td>1 to 2 (available from lumber yards)</td>
</tr>
<tr>
<td>Straw</td>
<td>4 to 6 (some can sprout)</td>
</tr>
<tr>
<td>Black/white newspaper</td>
<td>6 to 8 sheets</td>
</tr>
<tr>
<td>Carpet samples</td>
<td></td>
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<tr>
<td>Black Plastic</td>
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</tbody>
</table>

6. Finally, make a decision about mulching the students’ gardens and or walkways. Create a plan on how to obtain the mulch and when you want to mulch the garden. Mark the mulching date on the calendar so you have something to work towards.

**Notes**
Mulching for Water Conservation

Preparation Time: 20 minutes
Total Lesson Time: 30 minutes to set up experiment, then 5 minutes each day for three days to monitor, and 15 minutes for closure on the last day

Background
Mulch is a soil covering that farmers and gardeners place on top of the soil to save both water and soil. Mulch may be made of a variety of materials, such as plastic sheeting, wood chips, compost, or straw.

In the summer, a nonmulched field must be watered more frequently than a mulched one. Mulch also helps shade the soil surface, keeping it cooler and thus preventing further water evaporation.

Mulch also helps hold the soil in place. Rain can easily erode bare soil, taking important topsoil with it. In many parts of California, soil erosion is evident on hillsides.

In this activity, students will conduct an experiment to see the effect of mulch on the amount of water that evaporates from soil.

Objectives
Students will be able to:
Conduct an experiment to compare water evaporation with and without mulch.
Describe the role of mulch in conserving water.

Materials
For the class:
- potting soil or garden soil
- garden mulch (if available)
- newspapers
- shredded newspaper or paper towels
- water
- waterproof pen for labeling
- balance scale, postal scale, or kitchen scale

For each group of 4:
- 2 copies of Springhill Farm farm profile
- 2 clear plastic cups (9-oz. size)
- 2 1-cup measuring cups
Preparation
1. Gather materials. Groups may share the measuring cups.

2. Cover tables with newspaper.

Doing the Activity
1. Give each pair of students a copy of the Springhill Farm farm profile and read it together as a class. Ask students whether anything surprised them about the reading. Lead the discussion toward the fact that Larry Peter dry-farms his potatoes. Make a list of the conditions that dry farming requires: good soil, good mulch, and so on.

2. Ask students what mulch is and have them share their ideas about the purpose of mulch. Explain that farmers and gardeners commonly use mulch to conserve water, to reduce the number of weeds, and to prevent soil from washing away. Tell the class that they will be conducting an experiment to see whether mulch affects the amount of water that evaporates from soil.

3. Have each group measure out ½ cup soil into each of their cups. Have them measure and pour ½ cup water into each cup.

4. Have each group place about one-half inch of shredded newspaper, paper toweling, or garden mulch on top of the soil in one cup. For comparison purposes, the other cup will have no mulch.

5. Have students weigh each cup and record its weight (the two cups will weigh about the same). Have them use a waterproof pen to label the two cups with the groups' names and the date.

6. Place all the cups on a countertop or windowsill.

7. Once a day for the next two or three days, give students time to weigh each cup and record the weights.

8. After the experiment, have students share their results with the class. Discuss how the mulch affected the amount of moisture in the soil.
Many varieties of potatoes are grown by Larry Peter at his 320-acre farm in the rolling hills west of Petaluma in Sonoma County. Larry grows at least 15 different types of potatoes each year and sells them as Springhill potatoes. In addition, Larry keeps more than 300 cows that supply milk for his Springhill dairy, where he produces many kinds of cheeses. These are called farm cheeses because they are made the old-fashioned way in small batches, which gives them lots of character.

You could say that being a potato farmer is in Larry’s blood. His ancestors were potato farmers in Ireland, and his parents raised their large family on an 18-acre farm outside Santa Rosa. “We all did garden chores, and I milked the cow,” Larry remembers. He recalls that potatoes grew exceptionally well on his family’s land and that they were part of most family meals.

On his own farm, Larry uses a technique called dry farming, which he learned from his parents. In dry farming, plants are not watered; they use the moisture already in the ground.
Dry farming requires the soil to be specially prepared. In March, after the soil has dried out a bit from the usual winter rains, Larry begins his work. First, he digs down 15 inches and turns the soil over. He does this every week for three weeks in a row. This brings ground water (water already in the soil) up to the surface so there is enough moisture to keep the young potato plants alive. As this surface water begins to dry out, the growing plants will send their roots down deeper to seek out more water. If all goes well, the potatoes will be ready for harvest in 65 to 75 days.

Harvesting potatoes is a little like digging for treasure. When the green part of the plant above the soil dies, the potatoes are ready to be taken from the ground. This can be done by a machine or by hand with a shovel. Larry uses both techniques.

Larry’s parents, Virgil and Georgia, used to take his potatoes to their house and wash and sort them before they were sent to market. These days, his dad is his top salesman at the Santa Rosa farmers market, one of several farmers markets where Springhill potatoes and cheeses are sold.

At the markets, Larry and his dad tell customers what the different types of potatoes taste like and suggest ways to cook them, since different potatoes are suited to specific dishes. Some are great for baking but would not make a good potato salad. Some are especially nice steamed with their skins on, and others make great mashed potatoes. Larry undoubtedly could tell you what kind of potato makes the best French fries. Educating consumers is a role Larry clearly enjoys. “I need a break in the routine to get away from the cows and to see people,” he grins.
**Nutrition Lesson: Cabbage**
The following activities are from *Harvest of the Month: Cabbage*.

A. Page 1:
   1.) Conduct a cabbage tasting, using the Cabbage Taste Test Form.
   2.) Graph the results of cabbage preferences.

B. Page 2: Find fresh examples (if not available, find pictures) of the different types of cabbage in the chart under “Botanical Facts” (page 2). Then use the following steps to learn about cabbage.
   1.) Read “How does a cabbage grow” and start a similar chart where everyone can see it. Using your samples, look at the characteristics of each of the cabbage to see if you can visually see the differences between them.
   2.) If students grew cabbage in last year’s garden, discuss what you grew. If students did not grow cabbage, consider if you might grow it this year. Talk about the growing process for cabbage. Do you start with seeds or small plants? How deep do you plant them? How long does it take for them to produce the vegetable that you eat? How do you harvest them? Review the parts of the cabbage.

C. Page 2: Review How Much Do You Need?
   1.) Review amounts needed.
      1 serving of cabbage is one cup raw shredded leaves (about 2 cupped hands full. Cooked, this amount is ½ cup.
      Remind students that eating a variety of colorful fruits and vegetables throughout the day will help them reach their recommended needs.
   2.) Complete “Making A Plan” worksheet. Develop a plan to document student goals and results.

D. Page 1 & 2: Read “Reasons to Eat Cabbage” and What are “Cruciferous Vegetables.”
   1.) Ask students to list why it is good to eat cabbage and other cruciferous vegetables.
   2.) Complete the Student Sleuths Activities.

E. Page 4: Read “School Garden Heads of Cabbage.” Complete the activity “Investigating Cabbage.”
   1.) Rinse and slice a cabbage lengthwise so the “tree” inside can be seen. (Hint: This is easier to see in red varieties.)
   2.) Have each group look at their half and take turns peeling the layers off.
   3.) Compare the textures and colors of inner and outer leaves.
   4.) Consider tasting the different layers and compare intensity of taste (if you have not already tasted cabbage).
   5.) Compare Nutrition Facts labels.
   6.) Complete Cabbage Worksheet.

F. Page 4, “Science Investigation”: follow the steps listed to determine whether a substance is an acid.

**Materials:**
- Can opener
- 1 can red cabbage (not sauerkraut)
Colander
Small bowl
Measuring spoons
3 glass jars
1 tablespoon vinegar
1 tablespoon baking soda
1 tablespoon distilled water

Procedure:
Open can of cabbage
Use colander to drain cabbage juice into bowl.
Put two tablespoons (30 ml) of juice into each glass jar.
Add vinegar to first jar. Record color of juice.
Add baking soda to second jar. Record juice color.
Add distilled water to third jar. Record juice color.
Discuss results.

Sample Discussion:
Acids and bases are chemicals with distinct properties. Red cabbage juice is a chemical indicator of acids and bases. This means that the juice will turn color when either an acid or base is present. (Hint: Red cabbage juice turns redder with acids and green with bases. Darker colors indicate a stronger chemical.) Common acids that can be found in the kitchen are lemons, apple juice, orange juice, black coffee and vinegar. Common basic elements include baking soda and egg whites.
Adapted from: The Science Chef Travels around the World, Joan D’Amico and Karen Drummond, 1996.

G. Cabbage Patch Math:
1.) Predict which is heavier – raw or cooked cabbage?
2.) Weigh a sample of raw cabbage. Then microwave sample and weigh again. Analyze results. (May also bake, boil or steam cabbage to yield different results. Discuss why different cooking methods result in differences in mass.)
3.) Estimate and measure the circumference of cabbage heads. Compare varieties. Use circumference results to find volume of cabbage heads.

H. Vegetables are Edible Plants:
1.) Complete Vegetables are Edible Plants worksheet.

I. Literary Expressions (optional):
1.) Discuss poetry and literary style elements (e.g., rhyming, alliteration, similes, metaphors, onomatopoeia, allusions, haikus, etc.).
2.) Make a Venn diagram to compare and contrast different cabbage varieties (e.g., red versus green).
3.) Use observations from Cabbages Tasting activity to make list of sensory terms. Select one cabbage variety and use sensory terms to write an “Ode to Cabbage.” Read poems aloud in class. Record what style elements are used in each poem.
J. Book: (optional) Consider reading a book with the students. Check with your librarian or the local library for a copy.

*Green Power: Leaf and Flower Vegetables by Meredith Sayles.* This is one of a science series that provides information on a variety of edible plants. Topics include where the plants originated; how they were first cultivated; how they’re currently grown, processed, and sold; to how they’re eaten around the world and what their scientific applications are. Each book in the series includes cross-sectional diagrams of the focus plants, literary quotes, nutritional information, sidebars, recipes, and activities. Supports the national science education standards Unifying Concepts and Processes: Systems, Order, and Organization; Unifying Concepts and Processes: Evolution and Equilibrium; Unifying Concepts and Processes: Form and Function; and Life Science as outlined by the National Academics of Science and endorsed by the National Science Teachers Association.

*A Seed Is Sleepy* by Dianna Hutts Aston (Author), Sylvia Long (Illustrator). The topic is seeds and includes masterful watercolors which includes text on two levels. Short poetic phrases in large print, aimed at younger children, give seeds accessible, anthropomorphic qualities: "A seed is sleepy"; "A seed is adventurous." Paragraphs in smaller print, which tackle science concepts and expand on the phrases, are geared to older readers. The format, with little space devoted to text, doesn’t always allow for thorough explanations, and kids will need help with many facts and terms. But the elegant watercolor pictures, which include helpful charts depicting a seed’s growth into a plant, will pull children into the basic botany, while the pages filled with enticingly detailed seeds, both common and exotic, will encourage kids to wonder about the plant world’s mysterious, gorgeous spectrum of possibilities.

These book offers the opportunity to review/discuss plants, gardens and growing foods.
Health and Learning Success Go Hand-In-Hand
Do more. Watch less. Test scores improve when students limit TV time and are more physically active. Encourage students to turn off the TV and video games and get at least 60 minutes of physical activity each day to help keep them healthy, strong, and focused. *Harvest of the Month* connects with core curricula to introduce students to fruits and vegetables and ways to be more active.

Exploring California Cabbages: Taste Testing

What You Will Need (per group of 4 students):
- Green, red (or purple), savoy and Chinese cabbage varieties; two heads of each variety for entire class
- Small sample cups (four cups each per group)
- Printed Nutrition Facts labels for each cabbage variety*
- White board and markers
- Cutting board and knife

Optional: Paper and pencils or other art supplies for students.


Activity:
- Wash and drain one head of each cabbage variety.
- Chop and fill sample cups, keeping varieties separate; label cups, cover, and set aside.
- Display four unwashed cabbage heads (one of each variety) in front of room.
- Compare different types of cabbages’ nutrient values using the labels.
- Distribute sample cups to groups, one variety at a time.
- Observe tastes, colors, and textures; record student observations on board.
- Discuss similarities and differences between varieties; vote on class favorite.

For more ideas, reference:
*Kids Cook Farm-Fresh Food*, CDE, 2002.

Cabbage Confetti

Makes 36 tastes at ¼ cup per serving

Prep time: 5 minutes
Chill time: 30 minutes

Ingredients:
- 1 (10-ounce) package shredded raw green cabbage
- 1 (10-ounce) package shredded raw red cabbage
- 1 (20-ounce) can crushed pineapple in 100% juice, drained (reserve ¼ cup juice)
- ⅛ teaspoon salt
- ⅛ teaspoon black pepper
- Small plates and forks

1. In large bowl, mix green and red cabbage with pineapple and juice.
2. Add salt and pepper and gently toss until well coated. Refrigerate for at least 30 minutes.
3. Place ¼ cup of salad on small plates and serve.

Nutrition information per serving:
Calories 15, Carbohydrate 4 g, Dietary Fiber 1 g, Protein 0 g, Total Fat 0 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 4 mg


Reasons to Eat Cabbage

A ½ cup of shredded cabbage provides:
- An excellent source of vitamin C and vitamin K (red, green, and savoy varieties).
- A source of vitamin A (red and savoy varieties).
- A source of folate (savoy variety).
- Phytochemicals in the form of indoles and isothiocyanates*.

*Learn about phytochemicals and cruciferous vegetables on page 2.

Phytochemical Champions*:
- Blueberries
- Citrus fruits
- Cruciferous vegetables (broccoli, cabbage)
- Soy foods
- Tomatoes

*Champion foods are rich sources of phytochemicals.

For more information, visit:
www.nal.usda.gov/fnic/foodcomp/search
What Are Cruciferous Vegetables?
- Cruciferous vegetables are plants that contain indoles and isothiocyanates, which are phytochemicals with possible anti-cancer properties.
- The Brassicaceae (also called Cruciferae) family takes its name cruciferous (meaning “cross-bearing”) from the shape of the plants’ flowers, which have four petals resembling a cross.
- Cabbage is a cruciferous vegetable. Other vegetables in this family include bok choy, broccoli, Brussels sprouts, cauliflower, collard greens, kale, Swiss chard, turnips, and turnip greens.
- Phytochemicals appear to work together with nutrients and fiber to provide health benefits.
- Isothiocyanates (in form of sulforaphane and indoles) act as an antioxidant, neutralizing free radicals that may damage cells.
- Phytochemicals may aid in detoxification of undesirable compounds and strengthen antioxidant defenses in cells.
- They are rich sources of glucosinolates, sulfur-containing compounds that give them their pungent aromas and spicy (some say bitter) taste.
- Like other dark green vegetables, many cruciferous vegetables are rich in folate and chlorophyll.

For more information, reference:

How Does Cabbage Grow?
Cabbage is the most easily grown vegetable of the Mustard family. It is a cool-season crop that matures prior to extreme heat. Cool-season crops are grown for vegetative parts, including the roots (carrots), leaves (cabbages), stems (celery), and immature flowers (broccoli). Due to smaller plant size and shallow roots, cabbages are often started from seeds indoors.

Growing Cabbage Heads

| Temperature | Grows best at 50 to 75 F |
| Soil | Sandy loam or raised clay soil beds; requires added compost and moisture |
| Exposure | Full sun or partial shade |
| Planting | Seedlings spaced 1 to 2 feet apart; rows spaced 2 to 3 feet apart |
| Days to maturity | 50 to 90 days |
| Harvest period | Average two crops per year (winter and spring) |
| Harvesting | Hand-harvested and field packed |

For more information, reference:
www.urbanext.uiuc.edu/veggies/cabbage1.html

Botanical Facts
Pronunciation: kāb’ij
Spanish name: cole
Family: Brassicaceae
Genus: Brassica
Species: Brassica oleracea
Group: Capitata
Cabbage is a cole crop of the Mustard family (Brassicaceae) and its varietal name, B. oleracea Capitata, distinguishes this cruciferous vegetable as being “in the form of a head.” (The Brassicaceae family was formerly called Cruciferae.) The word cabbage derives from the French word caboche meaning “head.”

The species B. oleracea, or wild cabbage, is grouped into seven major cultivars based on development. (See chart below for cultivars.) Within the Capitata Group, there are more than 400 cabbage varieties but most common are the green, red, purple, and savoy varieties. Most Asian cabbage varieties belong to another species, B. rapa. This includes Chinese cabbage, which is also known as Napa or celery cabbage.

B. oleracea Cultivar Group | Includes:
---|---
Acephala | Kale, collard greens
Alboglabra | Kai-lan (Chinese broccoli)
Botrytis | Cauliflower
Capitata | Cabbage
Gemmifera | Brussels sprouts
Gongylodes | Kohlrabi
Italica | Broccoli

For more information, visit:
http://plants.usda.gov

Image adapted from:
www.inspection.gc.ca
To download reproducible botanical images, visit www.harvestofthemonth.com.
**How Much Do I Need?**

A ½ cup of shredded cabbage is about one cupped handful. The amount of fruits and vegetables that each person needs depends on age, gender, and physical activity level. Children need at least 60 minutes of moderate to vigorous activity every day. Remind students that eating a variety of colorful fruits and vegetables throughout the day – in all forms (fresh, frozen, canned, dried) – will help them reach their recommended amount. Have students track their goals daily by recording their fruit and vegetable consumption in the MyPyramid worksheet.*


**Recommended Daily Amount of Fruits and Vegetables***

<table>
<thead>
<tr>
<th></th>
<th>Kids, Ages 5-12</th>
<th>Teens and Adults, Ages 13 and up</th>
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<tbody>
<tr>
<td><strong>Males</strong></td>
<td>2½ - 5 cups per day</td>
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*If you are active, eat the higher number of cups per day. Visit [www.mypyramid.gov](http://www.mypyramid.gov) to learn more.

**Student Sleuths**

1. Make a list of cruciferous vegetables that you eat and those you would like to try. What phytochemicals do they contain? What health benefits do these provide to your body? Develop a list of snack suggestions that include cruciferous vegetables and share with your classmates.

2. Fruits and vegetables provide different nutrients and phytochemicals based on what color they are. Research nutrients in different cruciferous vegetables. How do the nutrients differ based on what color the produce is? Look for recipes you can prepare at home that include these fruits and vegetables.

3. Purple and red cabbages contain anthocyanins. What are anthocyanins and what do they appear to do for the mind and body? Identify other fruits and vegetables that contain anthocyanins and develop a plan to try at least one in the next week.

4. What effect does cooking have on phytochemicals in cruciferous vegetables? What is the best way to consume cabbage to get the most phytochemicals?

**For information, visit:**
- [www.leafy-greens.org/cabbage_family.html](http://www.leafy-greens.org/cabbage_family.html)

**Cafeteria Connections**

Promote students’ health by incorporating more cabbage into school meals. Gradually replace items that typically use shredded lettuce or lettuce pieces with shredded cabbage. Start with one-quarter of the cabbage mixture and work up to one-half.


**Student Champions**

California is the nation’s top food and agricultural producer. More than half of the nation’s fruits, vegetables, and nuts come from California. Encourage students to participate in community activities and show their appreciation for California’s farmers.

**For example:**

- Interview a local farmer. Ask details about daily schedule, work duties, and why he/she likes it. Submit article for school newsletter.
- Send letter of appreciation to a farmer.
- Contact a local farmer and ask him/her to be a guest visitor at your school for the day.
- Write a children’s book (with illustrations) about the life of a farmer. Imagine what life would be like without farms.
- Participate in National Future Farmers of America Week (in February).

*For more information, visit: [http://www.ffa.org](http://www.ffa.org)*

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**A Head of Cabbage History**

- Nearly 3,000 years ago, wild cabbage indigenous to Asia and the Mediterranean slowly spread into Northern Europe by the Celts and later the Romans.
- Able to store for long periods, cabbage was a staple item of Europeans in the Middle Ages. Its juice was commonly used to heal wounds and as a cough remedy.
- In 1541, French explorer Jacques Cartier introduced cabbage to North America.
- Since cabbage contains lots of vitamin C, other explorers, including Captain Cook, traveled with it in order to prevent scurvy. Cabbage rapidly spread across the continent.

*For more information, reference: [http://aggie-horticulture.tamu.edu](http://aggie-horticulture.tamu.edu)*

**Home Grown Facts**

- With over 13,000 acres harvested for cabbages, California leads the nation in commercial cabbage production.
- Monterey, Ventura, Santa Barbara, Imperial, and San Luis Obispo are the leading cabbage-producing counties.
- Cabbage is shipped year-round in California reaching its peak in March for traditional St. Patrick’s Day fare of corned beef and cabbage.

*For more information, visit: [www.nass.usda.gov/About_NASS/index.asp](http://www.nass.usda.gov/About_NASS/index.asp) [www.cdfa.ca.gov](http://www.cdfa.ca.gov) [http://aggie-horticulture.tamu.edu](http://aggie-horticulture.tamu.edu)*

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4. What effect does cooking have on phytochemicals in cruciferous vegetables? What is the best way to consume cabbage to get the most phytochemicals?

**For information, visit:**
- [www.leafy-greens.org/cabbage_family.html](http://www.leafy-greens.org/cabbage_family.html)

**Cafeteria Connections**

Promote students’ health by incorporating more cabbage into school meals. Gradually replace items that typically use shredded lettuce or lettuce pieces with shredded cabbage. Start with one-quarter of the cabbage mixture and work up to one-half.


**Student Champions**

California is the nation’s top food and agricultural producer. More than half of the nation’s fruits, vegetables, and nuts come from California. Encourage students to participate in community activities and show their appreciation for California’s farmers.

**For example:**

- Interview a local farmer. Ask details about daily schedule, work duties, and why he/she likes it. Submit article for school newsletter.
- Send letter of appreciation to a farmer.
- Contact a local farmer and ask him/her to be a guest visitor at your school for the day.
- Write a children’s book (with illustrations) about the life of a farmer. Imagine what life would be like without farms.
- Participate in National Future Farmers of America Week (in February).

*For more information, visit: [http://www.ffa.org](http://www.ffa.org)
Physical Activity Corner
Pairing students with "workout buddies" can promote cooperation and increased participation. Teach students how to do Chinese jump rope, an activity that can improve kinesthetic movement and endurance. Set aside time each week for students to practice in a group.

Materials:
- Chinese jump rope (extra long, thick elastic band).

Activity:
- Two students place elastic band around ankles and stand a few feet apart.
- Third student completes a series of jumps/tricks between rope without touching the rope.
- Each time student completes jump series, the rope moves up (ankles, calves, knees, etc.); students should not stop between jump series (to promote endurance).
- If student misses jump or touches rope, move to next student.

For more information, visit: www.kidnetic.com

Adventurous Activities
Science Investigation:
Use cabbage juice to determine whether a substance is an acid or base.

Materials:
- Can opener, 1 can red cabbage (not sauerkraut), colander, small bowl, measuring spoons, 3 glass jars, 1 tablespoon vinegar, 1 tablespoon baking soda, 1 tablespoon distilled water

Procedure:
- Open can of cabbage.
- Use colander to drain cabbage juice into bowl*.
- Put two tablespoons (30ml) of juice into each glass jar.
- Add vinegar to first jar. Record color of juice.
- Add baking soda to second jar. Record juice color.
- Add distilled water to third jar. Record juice color.
- Discuss results.

*Allow kids to taste the canned cabbage. For sample discussion, visit www.harvestofthemonth.com


Just the Facts
- Many vegetables evolved from the original wild cabbage including broccoli, Brussels sprouts, cauliflower, collard greens, kale, and kohlrabi.
- All cole crops can be cross-bred, making it easy and economical to develop new cabbage varieties*. 
- Primary uses of cabbages include processed coleslaw (40-45%), fresh head (35%), sauerkraut (12%), various fresh-cut products (5-10%), and dried (less than 5%).
- Technological advancements in packaging have increased the number of cabbage heads for market about 30% since 1996.


Sources:
- www.fruitsandveggiesmatter.gov/month/cabbage.html
- www.ers.usda.gov/Briefing/Vegetables/readings.htm

Literature Links
- Elementary: Tiny Green Thumbs by C.Z. Guest and What is a Plant? by Bobby Kalman.
- Secondary: Green Power: Leaf and Flower Vegetables by Meredith Sayles Hughes and 100 Vegetables and Where They Came From by William Woys Weaver.

For more ideas, visit: www.cfaitc.org/books

This material was produced by the California Department of Public Health's Network for a Healthy California with funding from USDA SNAP, known in California as CalFresh (formerly Food Stamps). These institutions are equal opportunity providers and employers. CalFresh provides assistance to low-income households and can help buy nutritious foods for better health. For CalFresh information, call 1-877-847-3683. For important nutrition information, visit www.cachampionsforchange.net. © 2010
Cabbage

1. Make a list of cruciferous vegetables that you eat and those you would like to try. What phytochemicals do they contain? What health benefits do these provide to your body? Develop a list of snack suggestions that include cruciferous vegetables and share with your classmates.

Primary/Secondary-level response: Answers will vary.

- A phytochemical is a natural bioactive compound found in plant foods that works with nutrients and dietary fiber to protect the body against disease.
- Phytochemicals can have complementary and overlapping mechanisms of action in the body, including:
  - antioxidant effects,
  - modulation of detoxification enzymes,
  - stimulation of the immune system,
  - modulation of hormone metabolism, and
  - antibacterial and antiviral effects.
- Research suggests that phytochemicals, working together with nutrients found in fruits, vegetables and nuts, may help slow the aging process and reduce the risk of many diseases, including:
  - cancer,
  - heart disease,
  - stroke,
  - high blood pressure,
  - cataracts,
  - osteoporosis, and
  - urinary tract infections.

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Phytochemicals found in vegetable:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bok Choy</td>
<td>Sulphoraphane, indoles</td>
</tr>
<tr>
<td>Broccoli</td>
<td>Beta-carotene, lutein, quercetins, sulphoraphane, indoles</td>
</tr>
<tr>
<td>Broccoli sprouts</td>
<td>Sulphoraphane</td>
</tr>
<tr>
<td>Brussel sprouts</td>
<td>Sulphoraphane, indoles</td>
</tr>
</tbody>
</table>
2. Fruits and vegetables provide different nutrients and phytochemicals based on what color they are. Research nutrients in different cruciferous vegetables. How do the nutrients differ based on what color the produce is? Look for recipes you can prepare at home that include cruciferous vegetables.

Primary/Secondary-level response:
Answers will vary.

[Students can view the California Department of Education’s nutrient graphs at www.harvestofthemonth.com/EdCorner/nutrient-graphs.asp for a variety of cruciferous vegetables, such as bok choy, broccoli, cabbage, Chinese cabbage, collard greens, and kale. They can use the nutrient graphs to compare and contrast the various levels of nutrients among cruciferous vegetables. Some conclusions they may make might include: variations in colors result in varying levels of nutrients even among plants in same species (i.e., cabbage family); greens tend to have high levels of vitamin A; most varieties are good to excellent sources of vitamin A and vitamin C; and all varieties provide fiber.]

[Students can look for recipes with cruciferous vegetables at a variety of websites, like:]
- Network for a Healthy California Children’s Power Play! Campaign: www.cdph.ca.gov/programs/cpns/Pages/Recipes.aspx

3. Purple and red cabbages contain anthocyanins. What are anthocyanins and what do they appear to do for the mind and body? Identify other fruits and vegetables that contain anthocyanins and develop a plan to try at least one in the next week.

Primary-level response:
Anthocyanins are the reddish colors found in many fruits, such as strawberries, cherries, cranberries, raspberries, blueberries, grapes, and black currants. They may provide protection against heart disease and certain cancers.
### Foods and Anthocyanin Concentration

<table>
<thead>
<tr>
<th>Foods</th>
<th>Anthocyanin (in mg per 100 grams/food)</th>
</tr>
</thead>
<tbody>
<tr>
<td>aubergine (egg plant)</td>
<td>750</td>
</tr>
<tr>
<td>black currant</td>
<td>130-400</td>
</tr>
<tr>
<td>blackberry</td>
<td>83-326</td>
</tr>
<tr>
<td>blueberry</td>
<td>25-497</td>
</tr>
<tr>
<td>cherry</td>
<td>350-400</td>
</tr>
<tr>
<td>chokeberry</td>
<td>200-1000</td>
</tr>
<tr>
<td>cranberry</td>
<td>60-200</td>
</tr>
<tr>
<td>elderberry</td>
<td>450</td>
</tr>
<tr>
<td>orange</td>
<td>~200</td>
</tr>
<tr>
<td>radish</td>
<td>11-60</td>
</tr>
<tr>
<td>raspberry</td>
<td>10-60</td>
</tr>
<tr>
<td>red currant</td>
<td>80-420</td>
</tr>
<tr>
<td>red grape</td>
<td>30-750</td>
</tr>
<tr>
<td>red onions</td>
<td>7-21</td>
</tr>
<tr>
<td>red wine</td>
<td>24-35</td>
</tr>
<tr>
<td>strawberry</td>
<td>15-35</td>
</tr>
</tbody>
</table>

Source: [www.food-info.net/uk/colour/anthocyanin.htm](http://www.food-info.net/uk/colour/anthocyanin.htm)

**Secondary-level response:**

Anthocyanins are water soluble, reddish pigments found in many fruits, such as strawberries, cherries, cranberries, raspberries, blueberries, grapes, and black currants. Anthocyanins inhibit cholesterol synthesis, provide antioxidant cell protection, and may...
help prevent binding of carcinogens to DNA. They may provide protection against heart disease and certain cancers.

See chart above for examples of fruits and vegetables that contain anthocyanins.

4. **What effect does cooking have on phytochemicals in cruciferous vegetables? What is the best way to consume cabbage to get the most phytochemicals?**

   **Primary-level response:**
   Boiling cruciferous vegetables causes some of the phytochemicals to be lost in the cooking water. Cooking methods that use less water, such as steaming or microwaving, reduce nutrient loss.


   **Secondary-level response:**
   Boiling cruciferous vegetables causes some of the phytochemicals to be leached into the cooking water. Cooking methods that use less water, such as steaming or microwaving, reduce nutrient loss.


Sources:
- [www.leafy-greens.org/cabbage_family.html](http://www.leafy-greens.org/cabbage_family.html)
- [www.food-info.net/uk/colour/anthocyanin.htm](http://www.food-info.net/uk/colour/anthocyanin.htm)

Updated: April 2011
Cabbage
Brassicaceae *Brassica oleracea* L. var. *capitata* L. (analysis based on raw green cabbage)
Pictured from left: Savoy, green, red cabbages

Serving Size
- 1 Cup Shredded
- 70 Grams
- 17 Calories
  - 4% from fat
  - 15% from protein
  - 82% from carbohydrate
- 1 Gram Protein
- 4 Grams Carbohydrate
  - 2 grams dietary fiber
- 0.1 Gram Fat
- 65 Grams Water
- 13 Milligrams Sodium

Savoy cabbage has 7 times more vitamin A than green cabbage; green cabbage has 2 times more vitamin A than red cabbage. Red cabbage has 12% more vitamin C than green cabbage; green cabbage has 18% more vitamin C than Savoy cabbage. Green cabbage has 3 times more folic acid than red cabbage. Red and green cabbages have 2 times more fiber than Savoy cabbage.
## Green Cabbage

### Nutrition Facts

- **Serving Size:** ½ cup cooked green cabbage, shredded (75g)
- **Calories:** 17
- **Calories from Fat:** 0

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Value</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fat</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>0mg</td>
<td>0%</td>
</tr>
<tr>
<td>Sodium</td>
<td>6mg</td>
<td>0%</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>4g</td>
<td>1%</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>1g</td>
<td>6%</td>
</tr>
<tr>
<td>Sugars</td>
<td>2g</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>1g</td>
<td></td>
</tr>
<tr>
<td>Vitamin A</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td></td>
<td>4%</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>47%</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td></td>
<td>1%</td>
</tr>
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</table>

Other nutrients: Vitamin K (102%), Folate (6%)

Green Cabbage

**Nutrition Facts**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Amount</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
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<td></td>
</tr>
<tr>
<td>Calories from Fat</td>
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<td></td>
</tr>
<tr>
<td>Total Fat</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>0mg</td>
<td>0%</td>
</tr>
<tr>
<td>Sodium</td>
<td>6mg</td>
<td>0%</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>2g</td>
<td>1%</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>1g</td>
<td>4%</td>
</tr>
<tr>
<td>Sugars</td>
<td>1g</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>1g</td>
<td></td>
</tr>
<tr>
<td>Vitamin A</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Vitamin C</td>
<td>21%</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>1%</td>
<td></td>
</tr>
</tbody>
</table>

Other nutrients: Vitamin K (33%)

NDB No: 11109
Red Cabbage

Nutrition Facts

Serving Size: ½ cup cooked red cabbage, shredded (75g)

<table>
<thead>
<tr>
<th>Nutrition Fact</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>22</td>
</tr>
<tr>
<td>Calories from Fat</td>
<td>0</td>
</tr>
<tr>
<td>Total Fat</td>
<td>0g</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>0g</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>0g</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>0mg</td>
</tr>
<tr>
<td>Sodium</td>
<td>21mg</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>5g</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>2g</td>
</tr>
<tr>
<td>Sugars</td>
<td>2g</td>
</tr>
<tr>
<td>Protein</td>
<td>1g</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>1%</td>
</tr>
<tr>
<td>Calcium</td>
<td>3%</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>43%</td>
</tr>
<tr>
<td>Iron</td>
<td>3%</td>
</tr>
</tbody>
</table>

Other nutrients: Vitamin K (45%), Vitamin B6 (8%), Potassium (6%), Folate (5%)

Red Cabbage

Nutrition Facts

Serving Size: ½ cup red cabbage, shredded (35g)

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<tr>
<th>Nutrient</th>
<th>Value</th>
<th>% Daily Value</th>
</tr>
</thead>
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<tr>
<td>Calories</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Calories from Fat</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total Fat</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>0mg</td>
<td>0%</td>
</tr>
<tr>
<td>Sodium</td>
<td>9mg</td>
<td>0%</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>3g</td>
<td>1%</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>1g</td>
<td>3%</td>
</tr>
<tr>
<td>Sugars</td>
<td>1g</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>1g</td>
<td></td>
</tr>
<tr>
<td>Vitamin A</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Vitamin C</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>2%</td>
<td></td>
</tr>
</tbody>
</table>

Other nutrients: Vitamin K (17%)

Source: www.nal.usda.gov/fnic/foodcomp/search/
NDB No: 11112
Making a Plan

Using the chart below, find out how many cups of fruits and vegetables you should eat every day.

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age 10</td>
<td>Age 11</td>
<td>Age 12</td>
</tr>
<tr>
<td>Fruits</td>
<td>1.5 cups</td>
<td>2 cups</td>
<td>2 cups</td>
</tr>
<tr>
<td>Vegetables</td>
<td>2.5 cups</td>
<td>2.5 cups</td>
<td>3 cups</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age 10</td>
<td>Age 11</td>
<td>Age 12</td>
</tr>
<tr>
<td>Fruits</td>
<td>1.5 cups</td>
<td>1.5 cups</td>
<td>2 cups</td>
</tr>
<tr>
<td>Vegetables</td>
<td>2.5 cups</td>
<td>2.5 cups</td>
<td>2.5 cups</td>
</tr>
</tbody>
</table>

Please note: The recommended cups of fruits and vegetables listed on this chart are based on moderately active individuals (30-60 minutes of physical activity per day) from ChooseMyPlate.gov

Make a plan for how you will include fruits and vegetables in every meal.

For breakfast, I will eat_________________________________________

________________________________________________________________

For lunch, I will choose_________________________________________

________________________________________________________________

For dinner, I will select_________________________________________

________________________________________________________________

I am currently eating ____ cups of fruit and ____ cups of vegetables. I will need to eat ____ cups of fruit and ____ cups of vegetables to reach my goal.

My Goals!
Cabbage is a high source of vitamin C and K.
• Vitamin K helps to make proteins that cause your blood to clot. When you have a cut, vitamin K helps stop the bleeding.
• Opening of trade with Asia in the late 19th century brought Chinese cabbage to California.

Summarize the above information:

List 3 adjectives that describe cabbage:
1) __________________________________________________________________________
2) __________________________________________________________________________
3) __________________________________________________________________________

Did you know?

- Cabbage is a high source of vitamin C and K.
- Vitamin K helps to make proteins that cause your blood to clot. When you have a cut, vitamin K helps stop the bleeding.
- Opening of trade with Asia in the late 19th century brought Chinese cabbage to California.

My Goal!
I will eat _____ cups of cabbage or other green vegetables this week.

Red (Purple) Cabbage
Savoy Cabbage
Chinese Cabbage
Green Cabbage

Cabbage is a high source of vitamin C. Vitamin C:
• Helps keep your gums healthy
• Helps heal cuts and wounds
• Helps fight germs

1) Refer to last month’s worksheet on mandarins. Vitamin C is an example of an ___________________________

2) What is the percent Daily Value of vitamin C found in 1 cup of shredded, raw savoy cabbage? ___%

3) My body would benefit from eating more fruits and vegetables that contain vitamin C because__________________________

________________________________________
________________________________________
________________________________________
________________________________________

Nutrition Facts

Serving Size: 1 cup raw savoy cabbage, shredded (70g)
Calories 19
Calories from Fat 1

<table>
<thead>
<tr>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fat 0g</td>
</tr>
<tr>
<td>Saturated Fat 0g</td>
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<td>Trans Fat 0g</td>
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<tr>
<td>Cholesterol 0mg</td>
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<tr>
<td>Sodium 20mg</td>
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<tr>
<td>Total Carbohydrate 4g</td>
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<tr>
<td>Dietary Fiber 2g</td>
</tr>
<tr>
<td>Sugars 2g</td>
</tr>
<tr>
<td>Protein 1g</td>
</tr>
<tr>
<td>Vitamin A 14%</td>
</tr>
<tr>
<td>Vitamin C 36%</td>
</tr>
<tr>
<td>Calcium 2%</td>
</tr>
<tr>
<td>Iron 2%</td>
</tr>
</tbody>
</table>

Source: www.nutritiondata.com

For information on obesity prevention or food stamps, call 1-888-328-3483. This material was funded by the USDA’s Food Stamp Program, an equal opportunity provider and employer.
Vegetables are edible plants!

**Leaves:** Some leaf plants like spinach have loose leaves. But have you ever noticed that the leaves of a cabbage head are packed very tightly next to each other? Cabbage heads are round like soccer balls.

*What leaves do you eat?*

**Flower:** Did you know that eating broccoli or cauliflower means that you are eating flowers? The white head of the cauliflower is made up of little white flowers.

*What flowers do you eat?*

**Stems & Stalks:** They support the plant’s leaves, flowers, and fruits. We eat the crispy celery stalk and the stem of the asparagus plant. Celery sticks are a yummy snack, especially if they are eaten with peanut butter, cottage cheese or yogurt!

*What stems and stalks do you eat?*

**Bulbs:** Bulbs are thin, tightly folded layers of leaves attached to a short stem. The base of these big leaves is big—and it grows underground. The best example of a bulb is the onion and garlic.

*What bulbs do you eat?*

**Tubers:** Tubers, like bulbs and roots, grow underground. When you are eating a potato, you are eating a tuber. Have you ever seen a potato looking at you? The spots on a potato are called eyes. They are underdeveloped buds where new plants can grow from.

*What tubers do you eat?*

**Roots:** If you are eating carrots, sweet potatoes, turnips, or beets, you are eating roots! How did this root get so fat? It is because the plant ends up taking in more food than it can use, and so it stores the extra food in its roots. Then these roots get bigger and bigger until we pull them up and eat them!

*What roots do you eat?*

---

Content adapted from: jmu.edu/biology/k12/garden.parts.htm
# Seasonal Guide to Fruits and Vegetables

*It is easy to stay healthy and save money when you buy fruits and vegetables that are in peak season.*
*Keep it safe! You should always rinse your fruits and vegetables before you eat them.*

## Spring
- apricots
- artichokes
- asparagus
- avocados
- bell peppers
- collard greens
- grapefruit
- green peas
- guavas
- mangoes
- oranges
- papayas
- rhubarb
- strawberries
- swiss chard

## Summer
- apricots
- avocados
- bell peppers
- cantaloupe
- cherries
- corn
- grapes
- green beans
- green peas
- honeydew
- mangoes
- nectarines
- okra
- papayas
- peaches
- pears
- plums
- strawberries
- swiss chard
- tomatoes
- valencia
- oranges
- watermelon
- yellow squash
- zucchini

## Fall
- acorn squash
- brussels sprouts
- butternut squash
- chayote squash
- cherimoya
- grapes
- green beans
- honeydew
- kiwifruit
- okra
- pears
- persimmons
- pomegranates
- pumpkins
- sweet potatoes
- swiss chard
- tangerines
- tomatoes
- turnips

## Winter
- avocados
- brussels sprouts
- chayote squash
- cherimoya
- collard greens
- grapefruit
- guavas
- kiwifruit
- mustard greens
- oranges
- pears
- tangerines
- turnips

## Year-Round
- apples
- bananas
- beets
- bok choy
- broccoli
- cabbage
- cactus leaves
- canned fruits and vegetables
- carrots
- cauliflower
- celery
- chili peppers
- cucumbers
- dried fruit
- eggplant
- frozen fruits and vegetables
- garlic
- green onion
- jicama
- kale
- leeks
- lemons
- lettuce
- limes
- mushrooms
- onions
- parsnips
- pineapples
- potatoes
- radishes
- spinach
tomatillos
- 100% fruit juice
- 100% vegetable juice
Lesson Seven: How do you plant a garden the second year?

For March

“Planting Our Healthy Garden” from GROWING IN THE GARDEN: LOCAL FOODS AND HEALTHY LIVING, Iowa State University Extension and Outreach. It’s time to plant the garden you’ve been planning. Depending on your location, you may need to wait another month before planting. Students will learn about the food system by planting, watering, maintaining and eating goods grown in the garden.

Content objectives: Identify and implement efficient and productive methods to prepare the soil for gardening; Mark a garden; Plant seeds, sets, or transplants; and water the garden for the first time

Life Skill objectives: Healthy lifestyle choices, Critical thinking, Communication, Citizenship, Leadership, Decision making, Problem solving,

Core and STEM concepts and skills:
Science Science as inquiry, Earth and space, Life science
Math Operations and algebraic thinking, Numbers, Measurement and data, Geometry, Mathematical practices
Language Arts Reading for information, Vocabulary, Speaking, Listening, Viewing

Healthy snack: Water and a simple fresh fruit or vegetable snack with or without dip

Additional and supporting resources:
Cooperative Extension Master Gardener’s Program can be a resource for planting your garden.
LESSON PLANS FOR 2012-13 SCHOOL YEAR, GRADE 5

March: How do you plant a garden the second year?

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Grade 5-6 Lesson 7 March
BEFORE THE LESSON

1. **Grade 5, March: Planting the Garden, 2012-13 School Year**
   This document contains all the curriculum items and resources you need for this lesson. All lesson downloads are located on the [www.peoplesgarden.wsu.edu](http://www.peoplesgarden.wsu.edu) Educational Toolkit. Please read through everything well in advance of delivering this lesson.

2. **Gardening Tips for Working With Kids, Healthy Gardens, Healthy Youth Partnership**
   **How do you plant a garden?** Iowa State University Extension and Outreach
   Master Gardeners and extension educators created the tip list based on their experiences gardening with kids for this project and for related summer programs. You may want to make a copy to keep handy throughout the gardening season. The garden planting document provides information about garden seeds and plants, tools, planting times, and a garden plant shopping list. You may want to read through it to do an inventory of garden supplies and fill in the gaps.

3. Check with Extension or gardening experts to find out when you can plant cool season and then warm season crops in your region. If you can’t plant in late March or early April, please do a lesson you missed in the fall or trade this lesson with the April lesson.

4. Please follow-through with the notes from your January garden planning session.
   What changes are you incorporating into your garden?
   What did the students decide to plant and why?
   Is it a cool or warm season crop?
   Where are you planting and what method are you using? (Square foot gardening or row gardens)
   Who are your garden helpers and how can you prepare them?
   Are the planting supplies ready to go?

5. Make sure you have all the supplies you will need to do the lesson, plant the garden, drink water, and eat a healthy snack.

6. **Garden Journal**
   If they haven’t done so already, this is a good time for each student to start his or her own Garden Journal. Each time you do a lesson or go out in the garden, there is an opportunity to add something new to the Garden Journal. Provide 1” vinyl binders or sturdy plastic folders with 3-ring binders so that students can take their journals to the garden and add pages, activity sheets, charts, recipes, etc. The binders with a clear sleeve on the front are nice because students can design their front cover on a heavy piece of paper and slide it into the sleeve. The students can also design their own inside cover page. Provide permanent markers so they can at least creatively write the title, using their first and last name such as “Charlie Smith’s Garden Journal”, on the front of the binder or folder. We have found that it works best to collect the journals after each use. Students can also keep their Garden Records in their journal notebook. See The Lesson Section, Garden Record, for more details. Your Extension organization may have additional suggestions for garden journals.

7. **Recipe:**
   Since planting the garden takes quite a bit of time and clean up, we are suggesting water and a simple fresh fruit or vegetable snack with or without dip. Students can help prepare the snacks before planting the garden. The snacks and dips can be chilling and ready when they are done gardening. Here are some simple dip recipes or you can buy dip – try to keep it low fat.
Quick Fruit Dip
In a small bowl, mix 1 cup of plain yogurt with 2 teaspoons of brown sugar.

Zippy Vegetable Dip
1. Combine 1 cup of low fat cottage cheese, 1 cup of plain yogurt, and 1 1-ounce package of dry ranch dressing in a blender. If you don’t have a blender, use a mixer.
2. Blend on medium speed approximately 30 seconds or until the mixture is smooth. Stop the blender a few times to scrape the mixture down the sides. If it is too thick, thin it with 1 or 2 tablespoons of skim milk or buttermilk.

THE LESSON
1. You may want to work on the Planting Our Healthy Garden lesson over a period of days. The outline below provides ideas so that you can determine how and when you want to complete the lesson. The 5th grade students did this lesson last year but everyone needs to know all these things every time they plant a garden. There are sections that you may skip because of the type of garden you are planting. Here is a basic outline of the lesson.

Introduction: Use your Our Healthy Garden Plan to prepare to plant it

Do: Discuss what everyone knows about seeds, sets, seed pieces, and transplants
Get Ready, Get Set, GROW! activity sheet (Include in Garden Journal)
Garden Challenge Matching Game

Reflect: Choosing the Best Method for Planting Crops
Choosing Tools and Learning How to Use Them (Include Know Your Tools and Garden Tools Crossword Puzzle activity sheet in Garden Journal)

Apply: Garden Rules
Planting your garden (choose the type you are working in)
Starting Seeds Indoors (optional)
Wrap up and Healthy Snack
Garden Record (include in Garden Journal)

AFTER THE LESSON
1. You may want to add more pages to the Garden Journals so they can use their journals to do gardening at home. Here are some page ideas:
   a. Draw or right down how each plant was started (as seeds, sets, seed pieces or transplants) and how deep they planted them.
   b. Make predictions, with or without reading the seed packet, about when they will see the sprouts coming up out of the soil.
   c. Write the dip recipes down so that they can make the dips at home.
USDA FNS People’s Garden School Garden Pilot Project:  
Healthy Gardens, Healthy Youth  

Tips for Working with Kids and the Garden  

The following tips are from HGHY Master Gardeners and site leaders and are based on their experiences gardening with kids. These are tips for both school and the summer programs. A sample in-garden lesson outline can be found at the end of this document.

Be Prepared  
- Send home information about the garden program including the details about who is leading the program, what the kids will be doing, where the gardens are located, when the kids will be gardening, what is happening with the garden produce, and expectations of the young gardeners. All gardeners should be wearing close-toed shoes and have sun protection. They will not be allowed to work in the garden or with food if they are sick or have been sick within the last 24 hours.

- Every time you go to the garden, take supplies such as a first aid kit, wet wipes, water jug with cups (or have kids bring their own water) and water for washing the produce.

- Use lesson plans and educational resources to prepare for each session. Play a game, sing a song, act out a play, read a book, or make a garden-based craft each session. Remember to have fun! See the Sample Garden Session outline at the end of these tips.

Working With the Kids  
- Make sure the young gardeners know the 3 R’s garden rules: Respect, Responsibility, Readiness.

- Be fully prepared before heading to the garden so there will be little down time for the kids. The tools and any supplies should be easy to access and ready to go. Break large groups into manageable sizes. Have more than one activity and rotate them. Keep every child busy and on task or their attention will shift and they will drift. Have enough adult supervision to make this happen.

- Always demonstrate before letting the kids work on their own. The more adult helpers you have to float around and guide the kids, the better. Do not do things for the kids, show them how and have them show you how back.

- Check their work. Don’t take their word for it when they say they have completed a task. You might find that things were missed.

- Take frequent shade and water breaks. Break times are good times to introduce healthy snacks, books, garden journals, or other hands-on activities.

- Every child will appreciate some one-on-one time with instructors while working in the garden. Let them tell their stories and show you the weeds they found and pulled, etc.
Planning the Garden

- Use the hands-on, deeply aligned classroom lessons to help the students plan their gardens. The kids will have fun learning and taking ownership of the garden. They will get excited about choosing what to plant and how much they need to plant by doing these lessons. A Master Gardener or an experienced gardener is a valuable resource to help kids discover what crops can be grown in the climate and in the amount of space they will have to garden. Start a Garden Journal or Garden Records right away.

- Young students are not able to prepare the site for gardening. Master Gardeners and others can provide leadership for that. FFA students, parents, Ameri-Corps, Food Corps, garden clubs, retired teachers, neighbors and others have been instrumental in preparing the gardens and helping the youth in the planning stages.

- For the young children, have the sections of the garden already measured out and marked according to the garden plan. For the older youth, help them measure and mark the garden sections.

- Kids like to use garden tools, but they LOVE to use child-sized tools such as kid-sized rakes, hoes, shovels, watering cans, and gloves. The type of garden tools they need depend on the type of garden they will be working with and how it is planted – square foot vs. rows. They can share tools. Older students have been using adult-sized tools and even tools that have been loaned by Master Gardener groups.

- Master Gardeners and FFA members are using their green houses to start seeds and grow transplants for the school gardens.

Help the students start a compost bin and get the whole school involved.

Planting

- Go over tool safety rules for hoes, trowels, and rakes. A tool safety game is part of the gardening curriculum.

- Go over ways the plants in your garden are going to be planted: seeds, sets, transplants, seed pieces.

- Plant fast growing (cool season) crops like radishes and spinach for early satisfaction. Try to stagger your crops for constant harvest opportunities. Make sure the students will have something to harvest when they return to school in the fall.

Maintaining

Watering

- Watering is extremely important, especially in raised bed gardens. If you are meeting just once a week, you may have to make plans for additional watering. Families, youth groups, organizations, neighbors can sign up for times. Someone will need to be responsible to make sure the watering plans are carried out.

- Using a watering wand is a good way to water the garden. Show how to water at the base of the plant. Teach the kids to count how long it takes to water a plant.
Weeding
- Help the kids distinguish the difference between weeds and garden plants. Show them how to pull weeds so that the garden plants are not disturbed. Tell them where you want them to put the weeds. Have challenges such as finding the biggest weed, most unusual weed, most weeds, etc. Talk about why some parts of the gardens have more weeds than other parts, etc.

Insects and pests
- Insects intrigue and scare children. They enjoy doing the lessons about pests and going on hunting missions to find and eradicate them. Getting to show everyone the squash bug they found – and sometimes their eggs – is a joy in and of itself!
- Use the lessons from Grades 2 and 4 to identify “good guys” and “bad guys” in the garden and to figure out what to do about them. Then help the kids take the next steps to protect their garden from unwanted pests.

Harvesting, Preparing and Eating the Produce!
- Kids get excited when they see fruits/vegetables growing on the plants. Make sure that they show everyone by pointing and not picking! Describe what to look for to determine when the fruits/vegetables are ready to harvest.
- Show kids HOW to harvest produce gently. For example, gently hold a bean plant before pulling off the bean, cut the lettuce with scissors, etc.
- Kids love to harvest and taste the bounty. Try to include this in every lesson.
- Include in the lesson, ideas for how the food can be eaten. Simple recipes such as cucumber-flavored water, radish or veggie sandwiches, veggies with dip, cucumbers and onions in vinegar, etc. are the best. Get a large bottle of Ranch dressing because the kids will try anything they can dip! There are several ideas in the lessons.
- Show the whole vegetable before cutting it open. Have them find the seeds.
- Plastic plates and knives can be used for cutting and preparing produce.
- Help the kids put their gardens to bed.
Sample Gardening Session

1. Meet in gathering area
   a. Remind everyone about behavior expectations.
   b. Chat a bit – What’s up?
   c. Give garden plan for the day
   d. Split into smaller groups if necessary
   e. Have a planned garden activity for each group with an adult supervisor

2. Garden projects
   a. Planting
   b. Weeding
   c. Pest patrol
   d. Watering
   e. Harvesting
   f. Washing
   g. Cutting (if necessary)

3. Snack time
   a. Make their own snacks
   b. If there is nothing to harvest, consider produce from farmer’s markets
   c. Focus on fruits and vegetables
   d. Send ideas home to the families

4. Activity session – see lessons for ideas for games, songs, stories, plays, crafts

5. Go home!
How do you plant a garden?

UNIT 5 INTRODUCTION

Lesson contents

- Planting Our Food Garden (Grades K through 4)
- Planting Our Healthy Garden (Grades 4 and up)

General Information

Planting is one of the most exciting aspects of gardening. It is the beginning of an adventure and the next step toward producing a crop to harvest. The lessons in this unit will guide youth to implement the garden plans they created during the Planning Our Food/Healthy Gardens lessons. Together, you will look at seeds, sets, transplants, seed pieces, garden tools, tool safety, planting methods, and watering. This Introduction will help you to prepare for a successful gardening experience. Extension Master Gardeners, local foods producers, and avid gardeners would be good partners throughout this unit and can provide their expertise throughout the rest of the gardening season.

Garden Seeds and Plants

Every year you will need to prepare a “shopping list” for the seeds and plants that you are going to need for your garden. The “Garden Plant Shopping List”, found at the end of this Introduction, is a worksheet that will help to determine how much to buy. You may want to work through the columns with the older youth, but it is too complicated for the younger ones.

Seeds can be purchased early in the season, weeks before they are actually planted. Seeds should be stored in an airtight plastic container and kept in a cool, dry location until planting time. Although most left over garden seed can be saved until the following season, some may not germinate well if it isn’t stored properly. If you have left over seed, seal the open end of the packet with tape and store it in an airtight container in the refrigerator or location with a consistent temperature, not a garage or storage shed.

At planting time, keep the seeds dry prior to planting. Carefully tear or cut off the top edge of the packet to leave the plant descriptions and planting instructions intact. For ease in planting, you may want to pour your small seeds in a clean and dry recycled shaker such as a spice or cheese container. Be sure to label the shaker and keep the seed packet with the shaker. For slightly larger seeds, you may want to use the pinch cup method. Right before planting, pour the seeds in a labeled 3 to 5 oz. plastic cup so that the students can pinch out a few seeds for planting. Larger seeds can be poured into small labeled plastic containers such as labeled butter tubs. For any of these methods, keep the seed packets near the matching containers so that everyone can read the descriptions and planting instructions. Return extra seeds back to their original packet.

General Information continued on the next page.
Some crops, such as tomatoes, peppers, eggplant, broccoli, and cabbage are planted as transplants to get a jump start on the growing season. The seeds are planted indoors in small containers or cell packs 5 to 8 weeks before being planted in the garden. For information and activities to grow your own transplants, please refer to the Starting Seeds Indoors activities found in the Apply section of lesson 5B. Be sure that you have the right amount of sunlight, heat, protected space, and time before starting your own transplants.

Before transplants are planted in the garden, set them outside in a shady location for a few days and keep them watered. Gradually move them into the sun. After five to seven days they should be ready to plant in the garden. This is called “hardening off” and prepares the plants for the outdoor environment and reduces the shock associated with transplanting.

When it comes to planting, remind the students that transplants are “baby plants” and should be handled gently and carefully like other babies. Transplants in cell packs can be removed from the packs by pushing up from the bottom. Use care when handling the plants because the plants will not survive if the stems are broken. If tomato transplants are tall and leggy, they can be planted a few inches deeper in the soil. However, most other plants should not be planted more than an inch deeper than what they were growing in the cell pack. Immediately after planting, generously water the soil around the transplants.

Potatoes are planted using seed pieces that are actually potatoes that have been grown specifically for planting. You can purchase them at local garden centers early in the spring. Select potatoes that are firm and just beginning to sprout. Avoid those that are soft, show signs of rotting, or have sprouts more than a quarter of an inch long. Do not use potatoes from home that have sprouted.

Cut the potatoes into sections with one or more “eyes” or sprouts on each piece. Each eye, or bud, has the potential to sprout a stem. One potato can be cut into 2 to 4 pieces. The potatoes can be cut into seed pieces the day before planting and stored in a paper bag. Plant them a foot apart, about 4 inches deep with the sprout side up (cut side down).

Onions are often planted as small, dry onion bulbs called sets. These are easier for children to handle and plant as compared to the small onion transplants that are sold banded together in bunches. Onion sets are sold in bulk or in mesh bags. Purchase sets that are firm and not yet sprouted. Plant them about 3 or 4 inches apart and about 1 inch deep with the pointed end up.

TOOLS
Tools are an important part of gardening. Having the right tools on hand makes the planting more efficient and successful. Lessons 5A and 5B include tool identification, handling, and safety activities. The following tool list is a guide to the types and amounts of tools you may want to acquire for gardening with a group of youth. How many of each tool depends on the number of young gardeners working in the garden at the same time and the size of the garden space. If there are several gardeners, the best way to manage tools and students is to assign different tasks to different groups of students and then switch tasks so everyone can try everything. When multiple groups or classrooms are gardening at the same location, they can alternate the times they are in the gardens so that they can share tools.
GENERAL PLANTING TOOLS

(These can be used with all types of gardens.)

**Measuring tape:** To mark the garden according to the plan

**String and stakes:** To mark the rows or the sections of the garden

**Garden markers or labels:** The students should make their own garden markers or labels using suggestions from the lessons such as craft sticks, wooden spoons, laminated note cards, vinyl blind slats, or other creative ideas. However, if you are pre-marking their garden spaces, you may want to use your own garden markers to help the youth and adults figure out where to plant things. Mark each end of a row or corner of a square foot garden space designated for a particular crop. Your markers can be replaced by the youths’ markers and you can use your markers again somewhere else or as back-ups.

**Square foot garden templates:** These can be made from poster boards using the templates found at the back of each of the lessons. You may want to make two or three of each template for small and medium-size plants. The students can put the template in the appropriate space in the garden, plant seeds in the hole spaces on the template, pick up the template and move it to another space, and start over again. Or, you can make a one or two of each template to place in the garden, sprinkle sand in the hole, move the template and repeat the process. The students can plant the seeds in the spaces marked with sand. Or, you can make several templates out of newspaper that you can leave in the garden as mulch. You will need to hold down the newspaper squares with twigs, garden markers or a thin layer of soil or mulch. The students plant their seeds in poked or cut holes and the newspaper is left to decompose.

**Choose a method to plant seeds using the square foot garden templates:** Most youth use their fingers. You can use craft sticks, spoons, dibbles, etc.

**Seed shakers and pinch cups:** See the Seed description in this Introduction.

**Rulers or Dibbles:** Dibbles are rulers made out of craft sticks. The instructions are found in Lesson 5B. Dibbles can be used to measure the depth of each hole and the distance between plants. They are also good digging tools to plant seeds in loose soil close to the surface.

**Watering can:** A can that has a spray head that can be removed so that you can use a spout offers the most versatility. Even if a hose is used in the outdoor garden, it is handy to also have at least one watering can that the students can use.

**Seeds, transplants, sets, seed pieces:** Purchase according to the garden plan and the Garden Plant Shopping List found at the end of this lesson.

**Scissors:** To cut open the seed packages, to cut the string or twine marking the rows, etc.

**Sign(s):** You may want to create a sign or signs to tell the public about your garden. Other signs may remind the young gardeners and their families about the rules for the garden. You may also want to consider posting “Do Not Spray” signs near your garden area to remind caretakers and neighbors that you want to protect your garden and gardeners from chemical sprays.
HAND WASHING STATIONS: You will want to make sure the gardeners have a place to wash and dry their hands.

FIRST AID KIT: Cleaning supplies, band aids, first aid cream, sun screen, insect repellent, anti-itch cream, and tweezers are handy emergency supplies.

SAFETY CLOTHING: This is what the students should be wearing to protect them from injury and sunburn. Shoes must cover the entire foot. The right hat can protect your face and neck. Sleeves, pant legs, or sun screen can also protect the skin. Garden gloves are optional. They can protect your hands and keep them cleaner, but they are sometimes awkward and cumbersome.

EARTHBOX OR CONTAINER TOOLS
1. One or two trowels

RAISED BED TOOLS
(Based on one 4' x 8' bed)
1. One or two hoes to work the soil before planting
2. One or two rakes to smooth out the soil before planting
3. Two to four trowels
4. Garden hose with a spray wand

TILLED GARDEN TOOLS
(Based on a 10' x 20' space)
1. Two to four hoes
2. Two rakes
3. Four trowels
4. Garden hose with a spray wand

It is a good habit to teach and practice tool maintenance after every use. Remove soil residue from trowels, hoe blades, and rakes before putting them away. It will keep the storage area clean and the tools will be ready for the next use. It is best to store tools in an indoor or enclosed location to extend their life and prevent damage such as rusting and weathered handles.

OUTDOOR PLANTING TIME
When can you start planting outdoors? Cool season plants, such as carrots, radishes, onions, peas, lettuce, spinach, and potatoes can be planted as soon as the soil thaws in the spring. Warm season crops can be planted once the threat of frost has passed.

Always be sure your garden soil is ready to be worked before you till or turn the soil over. Do not work the soil when it is too wet - that will result in large clods that are difficult to break apart and rake smooth. To determine if and when the soil is ready to be worked, take a handful and form it into a ball. If it forms a tight ball that doesn’t crumble with a little pressure, it is too wet to work. If it has moisture in it but crumbles apart under slight pressure, it can be tilled or turned over.

At planting time, have everything ready to go – tools, plants, volunteers, water, etc. Detailed instructions for guiding groups of students to plant are found in lessons 5A and 5B.
GARDEN PLANT SHOPPING LIST

Instructions. While looking at your garden plan, put an “X” next in the column to the right of all the crops that you will grow in your garden. In Columns 1 or 2, put an “X” to the right of the amount of seeds, sets, transplants or seed pieces according to whether you are planting in rows or square foot sections. In Column 3, figure out the portion of a 10 ft. row or the number of square foot sections you will be using for that particular crop. In Column 4, multiply either Column 1 or 2 times Column 3 and record the amount of seeds, sets, transplants, or seed pieces you will need. You will always need to purchase entire packets of seeds; but this will tell you how many packets to buy according to the total number of ounces needed.

<table>
<thead>
<tr>
<th>CROP</th>
<th>COLUMN 1 Seeds or plants for each 10 ft. of row</th>
<th>COLUMN 2 Seeds or plants for 1 square foot section</th>
<th>COLUMN 3 Total number of 10 ft. rows or sq. ft. sections</th>
<th>COLUMN 4 Amount to purchase (COLUMN 1 or 2 x COLUMN 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bush beans</td>
<td>.5 ounce</td>
<td>.25 ounce</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pole beans</td>
<td>1 ounce</td>
<td>.5 ounce</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beets</td>
<td>½ packet</td>
<td>¼ packet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broccoli</td>
<td>7 plants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cabbage</td>
<td>7 plants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrots</td>
<td>1 packet</td>
<td>½ packet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cauliflower</td>
<td>7 plants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweet corn</td>
<td>1 small packet</td>
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<td></td>
<td></td>
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<tr>
<td>Cucumbers</td>
<td>½ packet</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Eggplant</td>
<td>7 plants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kale</td>
<td>½ packet</td>
<td>¼ packet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kohlrabi</td>
<td>½ packet</td>
<td>¼ packet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaf lettuce</td>
<td>1 packet</td>
<td>½ packet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muskmelon (cantaloupe)</td>
<td>1 packet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Okra</td>
<td>.25 ounce</td>
<td>.12 ounce</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onion sets or plants</td>
<td>40</td>
<td>16</td>
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<td></td>
</tr>
<tr>
<td>Peas</td>
<td>1.5 ounce</td>
<td>.75 ounce</td>
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<td>Peppers</td>
<td>7 plants</td>
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<td>Potatoes</td>
<td>10 pieces</td>
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<td>Sweet potatoes</td>
<td>10 plants</td>
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<tr>
<td>Pumpkins</td>
<td>½ packet</td>
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<td></td>
<td></td>
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<tr>
<td>Radishes</td>
<td>1 packet</td>
<td>½ packet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinach</td>
<td>1 packet</td>
<td>½ packet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer squash (zucchini)</td>
<td>½ packet</td>
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<tr>
<td>Winter squash</td>
<td>½ packet</td>
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<tr>
<td>Tomatoes</td>
<td>4 plants</td>
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<tr>
<td>Watermelon</td>
<td>¼ packet</td>
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## Planting Our Healthy Garden

### UNIT 5  
**LESSON 5B**

**CONTENT OBJECTIVES**  
Plant a garden using “Our Healthy Garden Plan” from Lesson 4B and the most appropriate planting methods according to the type of garden and the plants that have been chosen for the garden. Experience personal health benefits of going outside, physical activities, water, and eating foods grown in gardens.

**LIFE SKILL OBJECTIVES**  
Critical thinking, decision making, cooperation, communication, citizenship, leadership, healthy living

**INDICATORS & EVALUATIONS**  
Students will successfully plant the garden according to the plans and planting methods from these lessons; Exercise in the garden, use water, and eat foods grown in a garden

**SUBJECT STANDARDS**  
21st Century Skills: Employability skills, Health literacy  
Science: Science as inquiry, Earth and space, Life science  
Mathematics: Operations and algebraic thinking, Numbers and operations, Measurement and data, Geometry, Mathematical practices  
Social Studies: Behavioral sciences, Geography  
Literacy: Reading, Speaking, Listening, Viewing

**CORE CONCEPTS AND SKILLS**  
Linguistic-words, Logical-mathematical, Spatial-visual, Bodily-kinesthetic, Interpersonal, Intrapersonal, Natural

**LEARNER TYPES**  
Our Healthy Garden Plan (from lesson 4B)  
Samples of seeds, transplant or seedling, onion set, potato seed piece (optional)  
Get Ready, Get Set, GROW! Worksheet (one per student, found at the end of the lesson)  
Garden Challenge flash cards (found at the end of the lesson)  
Paper clips  
Pencils  
Seed packets and plant labels (from the seeds or transplants that will be planted in your garden)  
Garden tools (see Reflect and Apply sections)  
Know Your Garden Tools (copy one per student, or do together on an interactive board or screen, found at the end of this lesson)  
Garden Tools Crossword Puzzle (copy one per student, found at the end of this lesson)  
Jumbo craft sticks (one per student)  
Rulers (one per student)  
Fine-tipped permanent marker or ink pen (one per student)  
Square foot garden template (found at the end of this lesson or use the one from Lesson 4B)  
Newspapers or poster board (see Reflect, Activity 4: Square-foot garden templates)  
Scissors

*Materials continued on the next page.*
INTRODUCTION

If you are ready to plant the vegetables (or fruits) in Our Healthy Garden Plan, stand near your chairs and use hand motions to pretend you are planting a garden. Give them a minute to start planting their pretend gardens. Then ask one side of the room to keep planting while the other side watches. Then reverse the process. Then have everyone sit down.

Did everyone plant their gardens the same way?
What different methods did you see?

What methods could we use to plant our garden and why?

What will we need to plant our garden?
We will need seeds, tools, markers, soil, water, sunshine, air, and each of us.

Raise your hand if you have planted a garden before.
For those of you who have planted a garden, have you always planted crops starting with seeds?
What did you use?
You may have used small plants called transplants, sets that look like the beginning of a vegetable such as onions, seed pieces that could be pieces cut from a potato, or seeds that come from the same kind of plant that you wanted to plant.

Are we planting container, raised bed or traditional in-the-ground tilled gardens?

What kind of tools do you think we will need to plant that kind of garden and why?

Pull on your ear lobes if you think we need to listen and learn in order to figure out a few more things before we jump into our gardens and start planting.
For those of you that are ready to plant, you can help the rest of us to make the best decisions for our plants, tools, and gardens.
TEACHER’S NOTES: You may want to have samples of seeds, sets, transplants, and seed pieces. Copy the Garden Challenge flash cards (found at the end of this lesson) so that you have three or four sets, depending on the number of students in the class (one set for every seven students). Cut them apart. Paper clip the sets of TEAM 1 flash cards. Repeat with the TEAM 2, and TEAM 3 cards. Copy the Get Set, Get Ready, GROW! worksheet, one per student. Students can take their completed worksheet home and teach their families how to plant different garden plants.

We just discovered that some plants can be started as seeds, but some plants will grow better in our garden if we start them in another way.

Why would it be a good idea to start some of our crops as small plants or transplants instead of direct seeding them in our garden?

A transplant is a small plant that is started from a seed and grown in a greenhouse until it is ready to be moved or transplanted into another container or the garden. By planting transplants or small plants called seedlings, the plants can get a few weeks head start and we can harvest them earlier than if they were planted by seed. Some crops don’t sprout well when direct seeded in the garden and do better when started as transplants.

Have you ever planted a small transplant or seedling?

What kind of plant did you plant?

Did you have to be careful when handling and planting the seedling and why?

Small transplants or seedlings are fragile. You have to be careful so that you don’t damage the root system or break the stem.

Besides seeds and transplants, what is another way in which crops are planted in the garden?

Some crops are started as parts of plants. For example, onions are planted as small onion bulbs that were started from seed the year before. They are called sets. Sometimes onions are planted as little plants and sold in bundles that were also started earlier.

Potatoes are planted from pieces of a cut-up potato called a seed piece. Each piece has a bud on it that will grow. (If possible, show a potato that is starting to sprout. Point out the eyes or sprouts.) A potato is actually a swollen, fat underground stem. Each one of those sprouts is like a bud that will grow into a shoot that grows up and above the ground. We plant potatoes from pieces of the potato with an “eye” or two on it. Each piece is planted in the garden about 4 inches deep.

How do you know how deep a seed should be planted?

The planting depth depends on the size of the seed. Typically, seeds are planted two to three times the diameter of the seed. Small seeds are planted shallow, larger seeds are planted deeper.

What could happen if the seed is planted too deep?

It won’t germinate.

What could happen if the seed is planted too shallow?

It might sprout then dry out and die. It might get washed away when it rains, blown away in the wind, or eaten by an animal.
GET READY, GET SET, GROW!

Distribute the Get Ready, Get Set, GROW! activity sheets. Go over the instructions and have the students complete it. They should be able to correctly match the crop with the way in which it is planted. You may want to display one large copy of the worksheet on the interactive board, flip chart, or some other way so that students can take turns drawing the lines between the categories as a way to check everyone’s answers.

GARDEN CHALLENGE MATCHING GAME

Divide the class into Teams 1, 2, and 3. The teacher is the moderator. Give Team 1 the flash cards with the pictures of the vegetable crops. Team 2 should have the flash cards with the different ways crops are planted – seeds, sets, transplants, and seed pieces. Team 3 should have the cards with the planting depths.

The game begins with Team 1 holding up one flash card for Teams 2 and 3 to see. Teams 2 and 3 quickly decide the match for that vegetable crop and hold up the appropriate flash card. Using the answer key below, the moderator could say “ding” if the answers are correct or “buzz” if it is incorrect. The students can work together to find the correct answers.

You can choose to keep score and play the game multiple times, giving the cards to different teams.

<table>
<thead>
<tr>
<th>ANSWER KEY</th>
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<tbody>
<tr>
<td>Pumpkin</td>
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<tr>
<td>Onion</td>
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<tr>
<td>Tomato</td>
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<tr>
<td>Pepper</td>
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<td>Lettuce</td>
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<td>Broccoli</td>
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<td>Cabbage</td>
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<td>Spinach</td>
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<td>Carrots</td>
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<td>Beets</td>
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<td>Snap bean</td>
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<tr>
<td>Corn</td>
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<td>Pea</td>
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<td>Potato</td>
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<td>Cucumber</td>
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<td>Radish</td>
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<tr>
<td>Squash</td>
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<tr>
<td>Sweet potato</td>
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TEACHER’S NOTE: In this section, you will need the students’ Our Healthy Garden Plan, the completed Get Ready, Get Set, Grow worksheets, seed packets or plant labels from the plants you will plant in your garden, Know Your Garden Tools (one copy for everyone to work on together), Garden Tools Crossword Puzzle (one copy per student), the tools you will use to plant your garden, craft sticks, rulers, permanent markers or ink pens, and scissors. Read Activity 4 in the Choosing Tools and Learning How to Use Them section and choose which type(s) of square foot garden template(s) you will need and be ready with the supplies. If possible, use the interactive board, a screen, or a large copy of the Get Ready, Get Set, Grow activity sheets so that everyone can work from the same sheet.

Distribute the seed packets or plant labels from the plants that you will be planting in your garden.

CHOOSING THE BEST METHOD AND TIME FOR PLANTING CROPS

We are ready to figure out how we are going to plant the crops we chose for Our Healthy Garden Plan.

Look at Our Healthy Garden Plan and the Get Ready, Get Set, Grow! activity sheet. Circle the crops that we will be planting on the activity sheet.

Are there any other plants that we will be planting that aren’t on the activity sheet? What are they?

Add them to the list and decide how they should be planted. Refer to the seed packets or plant labels for more information.

Some of you have seed packets or plant labels from the plants we will be planting. Look at the packets and labels and tell us the answers for these questions. We will write them next to the crop on the Get Ready, Get Set, Grow activity sheet.

What is the name of the crop?
When is the best time to plant it?
How deep should we plant it?
How far apart should we plant it?
How far apart should the rows be?
How many days until it should be ready to harvest and to be eaten?

Pass the packets or plant labels around so the students can see the pictures and read the information while you continue to discuss the following questions.

What vegetables are cool-season crops that can be planted as soon as the ground has thawed and harvested before the end of the school year and again in the summer for a late summer or early fall harvest?

What plants can we start inside now and transplant to the garden when it is warmer?

What tools will we need to grow these crops in the types of gardens we plan to plant? Have the students guess and then proceed to the next activity.
CHOOSING TOOLS AND LEARNING HOW TO USE THEM

Put the Know Your Garden Tools sheet on the interactive board, a screen, or make copies that everyone can see. Have the actual tools ready to show and use. Proceed with the following four activities.

ACTIVITY 1: TOOL IDENTIFICATION

Work through the Know Your Garden Tools sheet together, showing some of the actual tools, discussing the answers, and applying them to your garden space.

You may want to use the Garden Tools Crossword Puzzle as a take home follow-up activity. They can have their families help them finish the puzzle. Then have them bring the completed puzzle back and turn it in to see if they are ready to use the tools properly in the garden.

ANSWER KEY

<table>
<thead>
<tr>
<th>Across</th>
<th>Down</th>
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<tbody>
<tr>
<td>4. Rake</td>
<td>1. Trowel</td>
</tr>
<tr>
<td>5. Labels</td>
<td>2. Watering can</td>
</tr>
<tr>
<td>7. Hoe</td>
<td>8. Hose</td>
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<tr>
<td>10. Tiller</td>
<td>9. Fork</td>
</tr>
<tr>
<td>12. String</td>
<td>11. Shovel</td>
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<tr>
<td>13. Tape measure</td>
<td></td>
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</tbody>
</table>

1. Trowel
2. Watering can
3. Mulch
4. Rake
5. Labels
6. Water breaker
7. Hoe
8. Hose
9. Fork
10. Tiller
11. Shovel
12. String
13. Tape measure
ACTIVITY 2: TOOL SAFETY

Do the following Tool Safety Game.

TOOL SAFETY GAME

I am going to show you some right ways and wrong ways to use and store our tools. If you think I’m showing you the right way, clap. If you think I’m showing you the wrong way, stomp your foot.

- **Lift the hoe so that the blade is over your head like you are swinging a hatchet.**
  
  *STOMP.*
  
  I have lifted the hoe too high. I am not chopping the soil. I am hoeing it. It doesn’t work very well this way. Also, you may hit someone who is nearby if you swing the hoe this high in the air.

- **Lift the hoe so that it is about 1 foot off the ground and bring it down in a gliding motion through the surface of the soil.**
  
  *CLAP.*
  
  This is the correct way to use the hoe to cut through crusty soil and remove weeds.

- **Repeat the same motions with the rake.**

- **Lay the rake down, teeth up.**
  
  *STOMP.*
  
  You should never set a rake or a hoe on the ground like this. What do you think would happen? The teeth of the rake or blade of the hoe may go into your foot and the handle could pop up and smack you in the face. *(You may want to carefully demonstrate how the handle pops up.)*

- **Stand the rake and hoe, handles up, against a wall or hang them.**
  
  *CLAP.*
  
  Rakes and hoes should be stood against a wall or in the shed or garage when they are not being used.

- **Walk with the trowel blade up.**
  
  *STOMP.*
  
  Always carry your tools such as this trowel with the sharp blade facing down.

- **Run a short distance holding a hoe and a trowel.**
  
  *STOMP.*
  
  Never run with tools in your hands.

- **Pretend to wash dirt from the trowel, hoe, or shovel.**
  
  *CLAP.*
  
  It is always a good idea to clean the soil off your tools before you put them away. This shows you are responsible for taking care of your tools.

- **Pretend to fight with a student over a trowel or hoe.**
  
  *STOMP.*

  Show respect by taking turns.
ACTIVITY 3: DIBBLES

Since Roman times, long before Christopher Columbus discovered America, people made dibbers or dibbles, which are pointed wooden sticks that helped them make the right sized hole for planting seeds. One person would use the dibble for making the holes and another person would follow and plant the seeds. We are going to make our own dibbles and use the same process to plant the seeds in our garden. We will use craft sticks, rulers, and permanent markers or ink pens to make our dibbles.

Distribute the supplies. You might want to display the illustration on this page in a place for everyone to see. You may want to make your own dibber along with the students.

Line your craft stick up with the zero inch mark at the start of your ruler. Find ¼ inch on your ruler and make a little line from ¼” on your ruler onto about a fourth of your craft stick. Do the same at ½”, ¾”, 1”, 1½”, 2”, 3”, 4”, 5”. Then move your rulers to the other side of the stick and do the same thing. In between your two lines, mark the measurements using the number and the inch symbol.

Write your name on the back of your new dibble and store it where you can find it when we are ready to plant our gardens.
ACTIVITY 4: SQUARE-FOOT GARDENING TEMPLATES

If you are using the square foot gardening method, use the square foot garden templates found at the end of this lesson and have the students work in groups of three or four to make a full-size template for small plants and one for large plants. You can make them out of newspapers. If you do that, you can stake the templates in the garden using small sticks or your dibbles. Throw some soil over the top to keep them in place. You can make re-usable templates with poster board and laminate the poster board once the circles have been marked and the plant names have been added.

(The length of time required for this activity depends on types and sizes of gardens. You may want to start seeds indoors for late-summer or early-fall harvest crops. You can plant the seedlings or transplants in the garden once you have harvested the cool-season crops.)

TEACHER’S NOTES: Collect the Garden Tool Crossword Puzzle activity sheet and check for understanding. If you find that they aren’t familiar with the tools, you may have to do a review. This section could be much easier with the help of Extension Master Gardeners or members of your community who are familiar with gardening. Make sure that they have read over this section to know how to include all the students in the gardening process.

Choose the activities in this section that best match the type of garden and garden methods you will be using to plant your gardens. Regardless of the type of garden you will be planting, please be sure to do the Garden Rules and Wrap-Up activities.
GARDEN RULES

Establish the ground rules for the garden. You may want to write these on a re-usable poster board that can be creatively posted every time the class goes to the garden. Have the students repeat the three R’s – Respect, Responsibility, Readiness and give examples of how each of them applies to the garden.

RESPECT

_Yourself_ – Wear shoes that cover your entire foot, clothes that protect your skin from the sun and from being too cold or too hot, and practice safety.

_Your gifts_ – Share your energy, and use your skills and knowledge to help others.

_Other people_ – Be a good listener, consider others’ ideas, share tools, say please and thank you, ask questions rather than assuming things, do not get into each other’s spaces, and practice safety.

_Other people’s things_ – Do not touch or borrow things without asking, keep things clean and undamaged, and practice safety.

_The environment_ – Take good care of the garden and the space around it and remind others to do the same.

RESPONSIBILITY

_Be on time and stay where you are suppose to be._

_Listen and follow instructions._

_Use garden tools and supplies safely, clean them, and put them away correctly._

_Share in the work and the fun of the garden._ (Remember what happened in the Little Red Hen?)

READINESS

_Be ready to listen, learn, have fun, work hard, share, and most of all grow healthy food!_

Establish a “‘Gardeners Go’ cue with a clap or noise to indicate that gardeners can start their tasks and a “‘Gardeners Stop’” cue with two claps or a noise to indicate when gardeners should stop what they are doing and look at you for more directions. Have students practice going and stopping while they pretend to be hoeing or digging with trowels. Explain that this will make it easier to work with so many people in the garden, it will give everyone a chance to garden, and it will help to get the garden chores done in a limited amount of time.

CONTAINER GARDENS

_You will need Our Healthy Garden Plans, garden markers from Lesson 4B, trowels, rulers, dibbles, seeds, transplants, watering can, extra soil and possibly other garden supplies and watering equipment according to the type of container gardens that you are working with and where they are located. Have the students help to place the supplies near the container and then have them sit or stand near the container as you proceed with the following steps._
1. Checking container placement
   Do you think our container(s) are sitting in the best place to get the most sunlight?
   Look at your light sources and have the students move the containers if needed.

2. Checking the soil
   Most container gardens are filled with specially prepared soil.

   Why do you think we should not use soil dug from the ground in our containers?
   Although it may grow plants well outside, it becomes very packed in a container and
   the plant’s roots will not be able to get the air and water they need. Potting soils contain
   the right blend of materials to allow for good drainage while holding water in the soil
   for the plants. Some potting soil already contains fertilizer to help the plants grow.
   The white pieces in the mix are called perlite which is actually a volcanic glass that
   softens and expands when heated. It helps to prevent water loss and soil compaction
   so that the plants have a better chance to grow.

   Why do you think specially prepared soil for container gardens is lighter in weight
   than garden soil?
   That makes it easier to move the containers outdoors in the summer or to move them
   around indoors.

   Do you think we have enough soil in this container? Why or why not?
   If the plants are surrounded by the sides of the container, they won’t get enough light
   and air to grow. If the soil is right at the top of the container, it may overflow when
   you water it. The soil should be within 1 inch from the top edge of the container. We
   may need to add a little soil after watering because it will settle.

   Have the students check the soil level with their dibbles. If you need to add some soil,
   you should do it now.

   Have the students take turns turning the soil or smoothing the soil with a trowel.

   The students can feel the potting soil and look for the different ingredients in the soil
   mix. Have them describe what they feel and see. Compare it to the soil outdoors.

   Using a watering can filled with warm water, have a few students lightly water the
   soil in the containers. (This step can be skipped if using self-watering containers such
   as EarthBoxes™.)

   Why do you think we are watering the soil before we plant?
   Watering the soil before planting makes it ready for the seeds and plants. Watering
   now will settle the soil and we can add more soil if we need to. If we watered the
   soil for the first time after planting, the seeds may be washed out of position in the
   lightweight soil mix.

   Should we water the soil before we plant outdoor gardens?
   That is often not necessary because outdoor tilled gardens have some moisture present
   in the soil from rains or melted snow.
3. Marking your container for more than one crop
   If you are planting more than one crop in a container garden, help the students to use the plans, rulers, and the edge of their dibbles to mark out the sections. The students can then put the garden labels in the sections or containers to identify what they will be planting.

4. Planting the seeds, sets, or transplants
   a. Have the students hold up the right number of fingers as they number off as 1-dig, 2-plant, and 3-cover. After the students have numbered off, have the 1-dig students pretend to dig a hole with their dibbles, the 2-plant students pretend to plant a seed, and the 3-cover students pretend to cover the seed with soil.

   b. Demonstrate how to dig a hole ¼" deep using a dibble. Then use the edge of the dibble like a ruler to measure 3" from the first hole and make another hole ¼" deep. Have the students refer to the plans and seed packets or plant labels to help the 1-dig students use their dibbles to make the right size and depth of the holes and to measure the distance between seeds. All the 1-dig students should have an opportunity to dig and measure. You can also use the square-foot gardening template on some container gardens.

   c. Demonstrate how to take a seed out of the seed packet (or a small bowl or cup) and plant it. Have the 2-plant students plant the seeds, sets, or transplants in the holes.

   d. Using your dibble or your fingertips, demonstrate how to carefully cover a seed. Have the 3-cover students use their dibbles or fingertips to carefully cover the seeds, sets or transplants with soil.

5. Watering the seeds, sets, and transplants
   Water the seeds according to the method that comes with the kit; or, one student can be delegated (per container) to gently water the seeds with a watering can.

6. Cleaning up
   Have everyone help to clean off the trowels, wipe off the dibbles, and put them in the proper place for storing. Then have everyone wash their hands thoroughly.

RAISED BEDS AND TILLED OR TRADITIONAL GARDENS
You will need Our Healthy Garden Plan and garden markers from Lesson 4B, Garden Rules sign, hoes, trowels, square foot garden templates, dibbles, two balls of string, garden stakes (from a garden store; or, wooden spoons or large craft sticks), two or three tape measures, watering can, garden hose – according to the type and size of garden. The raised beds should be constructed and the soil should evenly fill the beds to within an inch from the top edge of the bed. The tilled gardens should be tilled, amended with compost and fertilizer, and ready to plant.

1. Moving out to the garden
   Have the students bring their dibbles, garden gloves (optional), and at least one of the items they will be using to plant their gardens and go stand around one of the raised beds, or at one end of the tilled garden. Have the students put their supplies on the ground behind them and have all eyes on you.
What are the three basic garden rules that start with the letter “R”?
Respect, Responsibility, Readiness

What cues are we using to start and stop what you are doing in the garden?
Practice the cues.

2. Preparing the soil
Why should we hoe and rake our garden(s)?
Hoeing and raking loosens up the soil so that water can pass through the pore spaces in the soil to reach the seeds. Then the roots and the sprouts can grow through the soil. It will also make it easier to plant the seeds.

Demonstrate how to use the hoes and rakes to carefully work and level the soil. Have the students form lines to each use a hoe to work the soil, get back in line, and then use a rake to smooth out the soil. If you have more than one garden space, divide the students into groups to prepare each space. Limit each student’s time by counting to 10 in thousands. Start the hoeing and raking with the “Gardeners Go” and “Gardeners Stop” cues.

3. Marking the garden
Use Our Healthy Garden Plan to decide where and how to plant the garden. Remind students that in raised bed gardens, they will be working from the outside edges of the garden and not walking into the garden. Therefore they won’t have to make walkways in the raised bed gardens.

a. If you are using the square foot gardening method throughout the raised bed, have the students lay down and stake (with their dibbles, extra craft sticks, or broken twigs) as many of the corresponding newspaper templates as they can in each section. Label the sections with the appropriate garden marker. You may want to write or circle the name of the crop you are planting right on the square foot templates.

b. If you are using just a few re-usable square foot templates, use them as measuring devices. Have students stand along the edges of the garden to measure out each section using the templates and the corner edge of a hoe to make trenches designating each section. Place the garden markers so that everyone knows what to plant in each section. A tilled garden should have walkways between each section so you can easily work in each section.

c. If you are planting rows in the tilled garden, you can have students make a Human Grid. Instructions follow in sections c1 through c3. It will keep everyone occupied and in place, especially when there are more than twenty students. It will also sharpen their math skills.

c1. Ask four students to work in pairs to measure the long edges of the garden. Give each pair a tape measure. One student can hold the end of the tape measure while the other one stretches it across the long edge of the garden and locks it. Lay the tape measures down along the long edges or sides of the garden.

Have two sets of students count off as 3’, 6’, 9’, 12’, 15’, 18’ (depending on the length of the garden). Then have them stand next to the garden at those markings on the tape measure. There should be two students standing across the garden from one another.
If your tilled garden has a center walkway, use a third measuring tape and your plan to determine where the walkway will go. Then have two students each take a stake to mark out the walkway. Then have those students each take a ball of string, wrap and tie one end of the string to the garden stakes, stretch it across the garden to mark the edges of the walkway. Wrap, cut, and tie the string on the stakes.

Any students who haven’t participated in these tasks will help with the rest of the marking tasks.

c2. Stand with the remaining students somewhere that everyone can see and hear. Show the garden plan and determine where each row or section of the garden will be. Starting at one end of the garden, determine where the first row or square foot section will go. Have the students standing nearest that measurement on both sides of the garden (for example, 3’) squat down and touch that measurement on the tape measure. Give a student a ball of string and two stakes and tell them to take it to one of the students pointing to the measurement. The student pointing to the measurement puts the stake securely into the ground. He or she may need help from the students standing nearby. The student with the string wraps and ties the string to the stake. Then she or he stretches it across the garden to the other student pointing to the measuring tape and repeats the same procedure. Take the scissors over to the students and have them cut the string before they tie it.

Have another student find the garden markers that match the crop to be planted in each row or section and stick it in the ground at the each end of the row or in a corner of a square foot garden section. This will tell the students what to plant in each row or section.

Have students take turns marking out the garden until all rows or sections are marked. Everyone can participate by helping one another find the right measurement, sticking in stakes, tying and cutting the string, finding and putting in the garden markers. Repeat this procedure to mark all the rows or sections. Remember to leave walkways around square foot gardening sections in tilled gardens, but not raised beds.

c3. If you are using newspaper square foot templates, have the students put them in the garden according to the plan and stake them with little sticks or craft sticks. If you are planting the same day, you may get by with staking just two corners of each template. If you are using poster board square foot templates, put them in the sections of the garden where they are to go according to the plan.

Have the students remain in place to start planting the garden.

4. Planting the garden

For raised bed gardens and tilled gardens using the square foot planting method:

Using the holes in the right-sized square foot templates, demonstrate how to use the dibble to make and measure a hole according to the planting instructions on the packet. Then carefully use your fingertips to plant one seed and cover it with soil. Show them how tiny the seeds can be and tell them that they can easily blow away so keep a hold of the seed packet and use fingertips to retrieve a few seeds out of the packet at a time.
Have students work in pairs to plant the seeds in all the holes of one or two square foot garden templates (according to the number of students and the size of the garden so that everyone has an opportunity to plant). One student can use their dibble to make the holes and the other can plant the seeds and carefully cover it with their fingertips. Then they can trade tasks. Use the “Gardeners Go” and the “Gardeners Stop” cues.

For rows in a tilled garden:

a. Hand hoes to the students standing on the sides that didn’t have an opportunity to mark the garden. Have another student read how deep to plant the seeds for that particular row. Have another student put their dibble right next to the string at the end of the row to measure how deep the furrow or shallow planting ditch should be. Then the student with the hoe can carefully put one corner edge of the hoe close to the dibble and next to the string to start the furrow by dragging the hoe half way across the garden. She or he should take the hoe to the student across the garden from him or her and that student can complete the furrow for the other half of the garden. In many cases, you may be stopping at each edge of the center walkway.

b. The two students standing on either side of the person making the furrow can work together to plant the seeds in the furrow on their half of the garden. Students can use their dibbles to make sure they plant the seeds at the right depth and that the seeds are planted the right distance apart.

c. Use the trowels to dig holes for the transplants. The measuring tapes will help the students determine the distance between the plants.

d. The students that weren’t standing along the side of the garden can help with the supplies and making sure that everyone is following the garden plan by planting the right seeds or transplants in the right places. They can also help the person planting by removing the transplant carefully from the cell pack or small container that it came in. If necessary, loosen the roots of the transplant.

5. Watering the garden

Make sure the tools are out of the garden before watering. You can leave the newspaper templates in the garden because they will decompose and prevent weeds from germinating. Water the entire garden area to make sure that everything is well watered. Use a hose with a water breaker or sprayer to thoroughly water the garden. Do not spray directly down on the garden and the seeds or it may wash away the seeds. Make it rain on the garden. Take turns watering sections of the garden.

You will need to water the garden weekly unless it rains an inch or more during the week or the ground is already too wet.

6. Cleaning up

Make sure the hoes, rakes, trowels and dibbles are scraped free of soil or wiped clean with paper towels or rags. Put them away according to tool safety rules. Have everyone wash their hands.
STARTING SEEDS INDOORS (optional)

At least four weeks before harvesting cool-season crops, you may want to start some of your warm-season crop seeds inside so that you can transplant them in your open garden spaces. Have each student make and plant their own pots. Make a few extra.

PAPER POTS

1. Wrap a 4 inch strip of newspaper around an empty frozen juice can or a water bottle with about 1½ inches hanging over the bottom of the can.

2. Fold the excess paper up around the bottom of the can or bottle to form the bottom of the pot. Press it down on the tabletop or pinch around the bottom edges to secure the paper pot and remove the can or bottle.

3. With one hand under the bottom of the pot, completely fill the pots with potting soil.

4. In the center of the pot, use a dibble to make a hole the right depth of soil for the seed you are planting.

5. Plant the seed and cover it with soil.

6. Place the pots close together on a flat or tray.

7. Water gently with a small watering can, or a squirt water bottle.

8. To encourage faster growth, cover the tray with a large, clear plastic bag, such as a dry cleaner’s bag.

9. Set it in a location that receives bright, indirect light.

10. Keep the soil moist.

11. Remove the plastic bag immediately after the seeds germinate or start to grow.

12. When the plants are 2 to 3 inches tall, use a trowel and plant the entire newspaper pot into your garden. Make sure the top edge of the newspaper is covered with soil so that it won’t act like a wick and pull the water away from the soil around the plant’s roots. The newspaper will decompose.

EGGSHELL PLANTERS

1. Tap the smallest end of an egg on a hard surface and peel it away. Pour the egg contents into a clean container. (If you are using clean hands, surfaces and equipment, you can cook the eggs into scrambled eggs – eggs are packed with complete proteins to nourish and energize our bodies. You can use an electric skillet, surface spray, add a little water to make fluffy eggs, and add salt and pepper – or salsa and cheese.)

2. You may want to wash out the eggshell planter and then put it back into the egg carton or tray.

3. Using a plastic teaspoon, carefully fill the eggshell with soil. Lightly pat the soil down and add more to fill the egg. Add a teaspoon or two of water to the soil.

4. Follow instructions 4 through 12 from Paper Pots above. When you transplant the pots outside, gently crush the eggshell before planting it in the ground. The eggshell will provide plant nutrients to the soil.
You may also choose to use peat pots purchased at local garden stores. You can plant the entire peat pot in the garden.

If you use small paper cups, gently take the plant out of the container or peel off the sides and bottom of the cup before you transplant the plant into the garden.

WRAP-UP

After the tools have been put away and everyone has washed their hands, it is time to re-energize with a healthy snack and record what you planted.

HEALTHY SNACK

The healthy snack should be water and fruits or vegetables and dip. As the students eat and relax from the gardening experience, ask the following question and share possible answers. Conclude that they will discover more about the answers as their garden grows.

Are we eating or drinking anything that we grew or used in our garden?
We are drinking water like we sprayed on our garden. (Discuss any of the snacks that you may have planted. If there aren’t any snacks that were planted from your garden, talk about whether the snacks grew in a garden, berry patch, vineyard, or an orchard.)

Why do seeds, sets, seed pieces, transplants, and growing plants need water?
They need water to start or continue to grow. While the plants are growing, they will need water to grow and produce the leaves, fruit and other edible parts of the plants.

Why do you need water?
We need water just as much as plants need water. Our bodies need water to stay alive and to help all parts of our bodies to work like they should. Our bodies are made up mostly of water, so it is important to keep our water levels up. Water helps us clean our bodies inside and out.

Look at the fruits and vegetables you are eating. How can you tell they have water in them?
They are firm and not shriveled; the skin looks shiny and not wrinkly. You can see and or taste the juice.

How do you know that you aren’t getting enough water?
You may have dry skin and hair, poor skin complexion, dull eyes, dry throat, get sick more often, don’t go to the bathroom regularly, you might pass-out, you don’t feel good, or you can’t think clearly.

We get vitamins and minerals that help our bodies to be healthy from eating vegetables and fruit. How do the vegetables and fruits get the vitamins and minerals that they pass on to us when we eat them?
The plant takes up nutrients from the soil. The plant uses water, carbon dioxide from the air, and sunshine or light to makes its own nutrients or plant food that becomes the food we eat, such as carrot roots, lettuce leaves, tomatoes, and strawberries.

Raise your hand if you are trying a new fruit or vegetable today. What is it and what do you like about it?
GARDEN RECORD

Remember, if you plant something new or harvest anything from your garden, please record it on your Garden Record page. If you haven’t started this page, please copy and use the Garden Record page found at the end of this lesson.
**Get Ready, Get Set, GROW!**

**Garden Plan**

- pumpkins
- onions
- peas
- sweet potatoes
- cabbage
- squash
- lettuce
- carrots
- tomatoes
- beans
- broccoli
- peppers
- potatoes
- cucumbers
- corn
- radishes

**Instructions:**

Draw a line from the plant to how it is usually started in the garden.

Put a star by the plants that you would like to grow sometime.
GARDEN CHALLENGE

TEAM 1  potatoes  TEAM 1  tomato

TEAM 1  peas  TEAM 1  onion

TEAM 1  carrots  TEAM 1  lettuce
GARDEN CHALLENGE

**TEAM 1**
- pumpkin
- broccoli
- spinach

**TEAM 1**
- pepper
- cabbage
- beets
GARDEN CHALLENGE

TEAM 1  green beans  |  TEAM 1  corn

TEAM 1  cucumber  |  TEAM 1  radish

TEAM 1  squash  |  TEAM 1  sweet potatoes
**GARDEN CHALLENGE**

*TEAM 2*  
seed pieces  

*TEAM 2*  
sets  

*TEAM 2*  
transplants  

*TEAM 2*  
seeds
**Know Your Tools**

<table>
<thead>
<tr>
<th>Tools</th>
<th>Garden Tool Use</th>
<th>Tilled Garden</th>
<th>Raised Bed Garden</th>
<th>Container Garden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gloves</td>
<td>Gloves protect hands and keep them clean.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rake</td>
<td>The short, stiff teeth on a garden rake are strong so that it can break up clods and make the soil smooth for seeds and plants.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fork</td>
<td>A garden fork loosens the soil and turns it over. It also can be used to harvest underground crops such as carrots and potatoes.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hose</td>
<td>A hose is used to take water from the water spigot to the garden. Several hoses can be connected so that the garden can be watered a fairly long distance from its source.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trowel</td>
<td>A trowel looks like a small shovel.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shovel</td>
<td>A shovel is used to dig larger holes for planting larger things in the garden and landscape, like trees and shrubs. It also can be used to turn soil over. Gardeners use shovels to add things, such as compost and manure, to their garden.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tiller</td>
<td>A tiller is a machine that a gardener walks behind to turn over the soil.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Tools | Garden Tool Use | Tilled Garden | Raised Bed Garden | Container Garden
--- | --- | --- | --- | ---
**Tape measure** | A tape measure that is long enough to stretch the length of the garden is important to have when it comes to determining where crops should be planted and giving them enough room to grow. |  |  |  
**Labels** | Garden labels or markers are important to identify the crops and know where everything is planted. Using the tape measure and your garden plan, the labels can be put in just before the garden is planted. |  |  |  
**Watering can** | A watering can holds one to two gallons of water and has a spout that allows you to gently water plants by hand. It is ideal for small gardens, but not very efficient for large, tilled gardens. |  |  |  
**Water breaker** | A water breaker is typically attached to the end of a hose to "break up" the flow of water into fine spray or forceful spray. On the "shower" setting, it wets the soil gently without washing the soil away from the roots or damaging the plants. |  |  |  
**String** | A string is used to stretch from a stake on one side of the garden to one on the other side. It is used as a guide to keep seeded and transplanted crops in a tidy straight row. |  |  |  
**Mulch** | Mulch comes in many different forms – grass clippings, straw, leaves, newspaper, black plastic, etc. It is laid over the soil to help conserve soil moisture. It also blocks light from reaching the soil so it prevents weed seeds from sprouting and growing. |  |  |  

---
Garden Tools Crossword Puzzle

Read the handout, “Know Your Garden Tools” to find the answers to the crossword puzzle.

Name

ACROSS

4. A tool used to smooth the soil to make a fine seed bed
5. Tools used to mark where crops are planted
6. A tool that fits on the end of a hose to gently water garden plants (two words)
7. A tool used to lightly cultivate the soil and remove weeds from the garden
10. A motorized tool used to prepare the garden soil for planting
12. A tool that is stretched down the row to assist with planting row crops
13. A tool used to accurately determine plant and row spacing (two words)

DOWN

1. A tool used to plant small plants in the garden
2. A tool used to water plants by hand (two words)
3. A tool used to cover the soil to reduce weed growth and conserve soil moisture
8. A tool used to move water from the source to the garden
9. A tool used to turn the soil over or dig underground crops, such as carrots and potatoes
11. A tool used to dig and add things to the garden, such as compost
SQUARE-FOOT GARDENING TEMPLATE

1. Make a copy of this page.
2. Cut around the squares and cut out the circles.
3. Place one template on one corner of a poster board.
   Draw around the outside of the square and around the circles.
4. Use the same template four times to make a square foot gardening guide.
5. Cut around the square foot and cut out the circles.
6. Write the names of the crops in the center of the guide.
7. It is best to laminate these guides to keep them in good shape from year to year.
SQUARE-FOOT GARDENING

TEMPLATE 2

peas, bush beans
## Garden Record

**YEAR:**

**YOUR NAME | CLASS | OR GROUP:**

<table>
<thead>
<tr>
<th>NAME OF CROP</th>
<th>AMOUNT PLANTED AND DATE</th>
<th>AMOUNT HARVESTED AND DATE</th>
<th>TOTAL AMOUNT HARVESTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: radishes</td>
<td>10 feet of row or 2 square feet or one 2.5 gram packet on April 15</td>
<td>32 radishes on May 20</td>
<td>27 radishes on May 25</td>
</tr>
<tr>
<td>Example: lettuce</td>
<td>16 feet of row or 4 square feet or one 1 gram packet on April 15</td>
<td>2 pounds on May 16</td>
<td>1 pound on May 25</td>
</tr>
</tbody>
</table>
**Lesson Eight:** Photosynthesis, Watering and Garden Maintenance

**For April**

“Photosynthesis” from GROWING IN THE GARDEN: ELEMENTARY CURRICULUM, Iowa State University Extension and Outreach; “Watering Garden Plants” from GARDEN MOSAICS, American Community Gardens and Cornell University Garden-Based Learning; “Caring for the Garden” from GOT DIRT?, Wisconsin Department of Health Services.

Students review photosynthesis and watering the garden. They make a plan for garden care during April and May. Now is time to start an optional Action Project based on what students have learned from gardening. Actions projects include doing background research, deciding what to do, completing the project and reporting on it.

**Content objectives:** Define photosynthesis; Identify the basic ingredients in photosynthesis and where they come from; Describe the basic photosynthesis process; Give reasons why photosynthesis is important to plants and animals; Demonstrate when, how, how much a garden should be watered.

**Life Skill objectives:** Healthy lifestyle choices, Critical thinking, Communication, Citizenship, Leadership, Decision making, Problem solving

**Core and STEM concepts and skills:**
- **Science**
  - Science as inquiry, Earth and space, Life science
- **Math**
  - Operations and algebraic thinking, Numbers, Measurement and data, Geometry, Mathematical practices
- **Language Arts**
  - Reading for information, Vocabulary, Speaking, Listening, Viewing

**Healthy snack:** Green Smoothie

**Additional and supporting resources:**
Cooperative Extension Master Gardener’s Program can be a resource for garden information.
LESSON PLANS FOR 2012-13 SCHOOL YEAR, GRADE 5_6

April: Food for Plants and People

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Garden Journal: See the Before section of the Lesson Plan# 6.

Recipe: Green Smoothie; see the Before section of the Lesson Plan # 7.
BEFORE THE LESSON

1. **Grade 5, April: Food for Plants and People, 2012-13 School Year**  
   This document contains all the curriculum items and resources you need for this lesson. All  
   lesson downloads are located on the [www.peoplesgarden.wsu.edu](http://www.peoplesgarden.wsu.edu) Educational Toolkit. Please  
   read through everything well in advance of delivering this lesson.

2. **Gardening Tips for Working With Kids**, Healthy Gardens, Healthy Youth  
   Master Gardeners and Extension Educators created the tip list based on their experiences  
   gardening with kids for this project and for related summer programs. You may want to make a  
   copy to keep handy throughout the gardening season.

3. **Gardens**: Please follow-through with the notes from your January garden planning session,  
   the January - Planning Our Food Garden, and the March - Planting Our Food classroom lessons  
   and gardening activities. Look ahead at this month’s garden activity: Caring for Your Garden.

4. **Compost**: If you haven’t built a compost bin, volunteers such as Master Gardeners or  
   student’s families that are familiar with gardening, can build one for your school. Please go to  
   the October lesson in the Educational Toolkit.

5. **Supplies**: Make sure you have all the supplies you will need to do the activities for  
   Photosynthesis and Watering as part of this Food for Plants and People lesson, Caring for the  
   Garden, and the Green Smoothie snack.

6. **Garden Journals**: Continue to use the students’ individual Garden Journals to record plant  
   growth, weather factors affecting the garden, observations, recipes, new knowledge, and  
   future ideas. These journals will be helpful to compile data for the classroom, share stories, and  
   make decisions.

7. **Recipe**: Green Smoothie Recipe makes about 3-1/2 cups. Tasting samples should  
   approximately 2 ounces, or 1/8 cup.

   - 1 banana
   - 1 tightly packed cup of kale, stemmed, washed and chopped
   - 1 cup of fresh or frozen berries, diced apple or pear
   - 1 cup juice or 1 cup of non-fat or low-fat vanilla Greek yogurt
   - up to 1 cup of ice

1. Place the kale, fruit and juice or yogurt into your blender. If you use fresh fruit, you may want  
   to add up to 1 cup of ice; if you use frozen fruit you may not need any ice.

2. Blend the ingredients together until the kale looks like it is well incorporated into the  
   smoothie
8. **Action Project**: Since this is the second year for your gardens, we suggest that the students might want to share something they have learned or experienced through an Action Project. Garden Mosaics created Action Project guidelines and models. Please review the Expansion Activity: Action Projects found in The Lesson section below. A complete Garden Mosaics Action Project guide is included. These resources will empower you and your students to make a difference in your community. It is similar to the students doing a community service or service learning project.

This is optional and should be conducted by the students and their teacher as a step to add sustainability and growth to their new gardening program. In April, the students can start with discussions and background research to decide what project they want to do and why. In May or June, they can actually implement or start to implement their plans.

**THE LESSON**

1. **Photosynthesis**
   
   The outline below provides ideas so that you can determine how and when you want to complete the lesson. The activities in this lesson help students to identify the basic ingredients in photosynthesis and where they come from, describe the basic photosynthesis process, and give reasons why photosynthesis is important to plants and animals. Here is a basic outline of the lesson.

   **Introduction:** Plants, animals and food

   **Do:** Photosynthesis Experiment, Photosynthesis Skit

   **Reflect:** Review of photosynthesis

   **Apply:** Photosynthesis Diagram
   Plants and Animals as Partners

2. **Watering Garden Plants**
   
   Follow the Garden Mosaics “Watering Garden Plants” science page and teaching tips. Review Composting from the February lesson, or if you were not able to complete the compost lesson, do it now.

3. **Caring for the Garden**
   
   Review Caring for the Garden from “Got Dirt”. Make a plan with the students on how to maintain the garden during April and May. Consider thinning, weeding, watering and pest management. Talk with your Extension Educator to see if Master Gardener might be available to assist with teaching these gardening skills.
4. Action Project (optional)
Consider implementing an Action Project.

5. Read a book with your students: (optional) Check with your library to see if they have a copy. *Photosynthesis* (Science Concepts Second) by Alvin Silverstein, Virginia Silverstein, Laura Silverstein Nun. This book introduces key concepts of science by exploring their development, applications, and relationships to scientific knowledge as a whole. Photosynthesis explains the process; the history of discoveries leading to current understanding of photosynthesis; and related issues such as acid rain, the greenhouse effect, and the use of basic materials that are directly or indirectly dependent on photosynthesis.

AFTER THE LESSON
1. You may want to go back to the Garden Journals so students can update previous pages and record how the plants are growing. Below are previously suggested pages that could be updated with results:
   a. Draw or right down how each plant was started (as seeds, sets, seed pieces or transplants) and how deep they planted them. UPDATE: was there a difference in plants growth for those started with seeds, sets, seed pieces or transplants?
   b. Make predictions, with or without reading the seed packet, about when they will see the sprouts coming up out of the soil. UPDATE: when did the seeds sprout? How has the weather affected the seeds growth?
   c. Add the Green Smoothie recipe to the journals for future use by students.
USDA FNS People’s Garden School Garden Pilot Project:  
Healthy Gardens, Healthy Youth  

Gardening Tips for Working with Kids

The following tips are from HGHY Master Gardeners and site leaders and are based on their experiences gardening with kids. These are tips for both school and the summer programs.

**Be Prepared**
1. Send home information about the garden program including the details about who is leading the program, what the kids will be doing, where the gardens are located, when the kids will be gardening, what is happening with the garden produce, and expectations of the young gardeners. All gardeners should be wearing close-toed shoes and have sun protection. They will not be allowed to work in the garden or with food if they are sick or have been sick within the last 24 hours.

2. Every time you go to the garden, take supplies such as a first aid kit, wet wipes, water jug with cups (or have kids bring their own water) and water for washing the produce.

3. Use lesson plans and educational resources to prepare for each session. Play a game, sing a song, act out a play, read a book, or make a garden-based craft each session. Remember to have fun! See the Sample Garden Session outline at the end of these tips.

**Working With the Kids**
4. Make sure the young gardeners know the 3 R’s garden rules: Respect, Responsibility, Readiness.

5. Be fully prepared before heading to the garden so there will be little down time for the kids. The tools and any supplies should be easy to access and ready to go. Break large groups into manageable sizes. Have more than one activity and rotate them. Keep every child busy and on task or their attention will shift and they will drift. Have enough adult supervision to make this happen.

6. Always demonstrate before letting the kids work on their own. The more adult helpers you have to float around and guide the kids, the better. Do not do things for the kids, show them how and have them show you how back.

7. Check their work. Don’t take their word for it when they say they have completed a task. You might find that things were missed.

8. Take frequent shade and water breaks. Break times are good times to introduce healthy snacks, books, garden journals, or other hands-on activities.

9. Every child will appreciate some one-on-one time with instructors while working in the garden. Let them tell their stories and show you the weeds they found and pulled, etc.

**Planning the Garden**
10. Use the hands-on, deeply aligned classroom lessons to help the students plan their gardens. The kids will have fun learning and taking ownership of the garden. They will get excited about choosing what to plant and how much they need to plant by doing these lessons. A Master Gardener or an experienced gardener is a valuable resource to help kids discover what crops can be grown in the climate and in the amount of space they will have to garden. Start a Garden Journal or Garden Records right away.

11. Young students are not able to prepare the site for gardening. Master Gardeners and others can provide leadership for that. FFA students, parents, Ameri-Corps, Food Corps, garden clubs, retired teachers, neighbors and others have been instrumental in preparing the gardens and helping the youth in the planning stages.

12. For the young children, have the sections of the garden already measured out and marked according to the garden plan. For the older youth, help them measure and mark the garden sections.

13. Kids like to use garden tools, but they LOVE to use child-sized tools such as kid-sized rakes, hoes, shovels, watering cans, and gloves. The type of garden tools they need depend on the type of garden they will be working with and how it is planted – square foot vs. rows. They can share tools. Older students have been using adult-sized tools and even tools that have been loaned by Master Gardener groups.

14. Master Gardeners and FFA members are using their green houses to start seeds and grow transplants for the school gardens.

15. Help the students start a compost bin and get the whole school involved.

**Planting**

16. Go over tool safety rules for hoes, trowels, and rakes. A tool safety game is part of the gardening curriculum.

17. Go over ways the plants in your garden are going to be planted: seeds, sets, transplants, seed pieces.

18. Plant fast growing (cool season) crops like radishes and spinach for early satisfaction. Try to stagger your crops for constant harvest opportunities. Make sure the students will have something to harvest when they return to school in the fall.

**Maintaining**

**Watering**

19. Watering is extremely important, especially in raised bed gardens. If you are meeting just once a week, you may have to make plans for additional watering. Families, youth groups, organizations, neighbors can sign up for times. Someone will need to be responsible to make sure the watering plans are carried out.

20. Using a watering wand is a good way to water the garden. Show how to water at the base of the plant. Teach the kids to count how long it takes to water a plant.
Weeding
21. Help the kids distinguish the difference between weeds and garden plants. Show them how to pull weeds so that the garden plants are not disturbed. Tell them where you want them to put the weeds. Have challenges such as finding the biggest weed, most unusual weed, most weeds, etc. Talk about why some parts of the gardens have more weeds than other parts, etc.

Insects and pests
22. Insects intrigue and scare children. They enjoy doing the lessons about pests and going on hunting missions to find and eradicate them. Getting to show everyone the squash bug they found – and sometimes their eggs – is a joy in and of itself!

23. Use the lessons to identify “good guys” and “bad guys” in the garden and to figure out what to do about them. Then help the kids take the next steps to protect their garden from unwanted pests.

Harvesting, Preparing and Eating the Produce!
24. Kids get excited when they see fruits/vegetables growing on the plants. Make sure that they show everyone by pointing and not picking! Describe what to look for to determine when the fruits/vegetables are ready to harvest.

25. Show kids HOW to harvest produce gently. For example, gently hold a bean plant before pulling off the bean, cut the lettuce with scissors, etc.

26. Kids love to harvest and taste the bounty. Try to include this in every lesson.

27. Include in the lesson, ideas for how the food can be eaten. Simple recipes such as cucumber-flavored water, radish or veggie sandwiches, veggies with dip, cucumbers and onions in vinegar, etc. are the best. Get a large bottle of Ranch dressing because the kids will try anything they can dip! There are several ideas in the lessons.

28. Show the whole vegetable before cutting it open. Have them find the seeds.

29. Plastic plates and knives can be used for cutting and preparing produce.

30. Help the kids put their gardens to bed.
Sample Gardening Session

1. Meet in gathering area
   a. Remind everyone about behavior expectations.
   b. Chat a bit – What’s up?
   c. Give garden plan for the day
   d. Split into smaller groups if necessary
   e. Have a planned garden activity for each group with an adult supervisor

2. Garden projects
   a. Planting
   b. Weeding
   c. Pest patrol
   d. Watering
   e. Harvesting
   f. Washing
   g. Cutting (if necessary)

3. Snack time
   a. Make their own snacks
   b. If there is nothing to harvest, consider produce from farmer’s markets
   c. Focus on fruits and vegetables
   d. Send ideas home to the families

4. Activity session – see lessons for ideas for games, songs, stories, plays, crafts

5. Go home!
# Photosynthesis

## Lesson 6

### Content Objectives
Define photosynthesis, identify the basic ingredients in photosynthesis and where they come from, describe the basic photosynthesis process, give reasons why photosynthesis is important to plants and animals

### Life Skill Objectives
Critical thinking, learning to learn by experimenting and observing, problem solving; communication

### Indicators
Draw the photosynthesis formula and diagram, respond to questions, list reasons plants and animals benefit from photosynthesis

### Subject Standards
Science: Life (characteristics of organisms, organisms and their environment)  
Language Arts: Vocabulary, character development, main idea, interpreting, inferring, sequencing, writing  
Math: Algebra

### Learner Types
Linguistic-words, logical-mathematical, bodily-kinesthetic, spatial-visual, music, intrapersonal, interpersonal, natural

### Materials
At least 4 paper circles *(the size of a quarter, see the Photosynthesis Experiment in the Introduction section of this lesson)*  
4 paper clips *(one paper clip per circle)*  
2 sheets of green paper *(in big letters write “Chloro” on one and “Phyll” on the other)*  
Tape to attach the green paper as name tags  
Large plastic mixing bowl  
Big mixing spoon  
1 cup of water  
Green construction paper with small holes punched in it  
Flashlight  
Marker board or large sheet of paper  
Markers  
“Photosynthesis” lyrics and “Diagram of Photosynthesis Process” *(project on screen or interactive board, found at the end of this lesson)*  
Overhead projector  
*Were You Born in a Barn?* CD by Chris Rowlands (contact Angela Rowlands at arowland1@woh.rr.com)  
CD player  
Blank sheets of white paper *(one per student)*
One week before the rest of the lesson

Talk to the school grounds maintenance staff to identify one or two plants to use for a photosynthesis experiment described in this section. You also could use plants in your school classroom. The plants need to have large leaves and a sunny location. You may want to try the experiment on two different plants. The experiment works best outside in the spring and early summer. Have the paper clips and circles ready for the experiment.

Everyone stand up.

What are some wild animals that live in our area?
Go around the room for answers such as rabbits, mice, insects, wild turkeys, deer, raccoons, snakes, frogs, birds, and so on. Have the students stand like their favorite animal and give them thirty seconds to pretend to find and eat their food.

What are some examples of domestic animals that live with us or on farms and depend on our care?
Go around the room for answers such as dogs, cats, horses, beef cattle, dairy cattle, pigs, layers (chickens that lay eggs), turkeys, sheep, and so on. Work in pairs and have one student be a person who cares for the animals and the other one choose which kind of domestic animal to be. Pretend that the caretaker is feeding the domestic animal. Switch roles.

What are some examples of plants that naturally grow in our area?
Trees, some grasses and flowers, weeds, etc.; stand like you are one of those plants and pretend to get your food.

What are some examples of plants or crops that people plant in our area?
Corn, soybeans, oats, grass, flowers, vegetables, apple trees, berries, grapes, etc.
In pairs, one person names a crop and stands like the plant. The other person is the one that grows that crop. Pretend that the plant needs food and act out what might happen such as watering or fertilizing the plant.

Think about pretending to be animals and plants trying to find food while you answer the following questions.

Plants and animals are living things; what makes them alike?
They both need food and water, and they reproduce. They both live and die.

What makes them different?
Plants cannot move to find food. They can make it for themselves from natural resources. Sometimes people help to feed plants with water and nutrients such as plant food, fertilizer, or animal manure.

Is it important to animals if plants get fed?
Yes.

Why?
Most animals eat plants. Plants are also used for shelter and protection.

What are the two major plant crops grown in Midwestern states, such as Iowa, that feed domestic animals on the farm, such as pigs, cattle, sheep, dairy cows, chickens, and turkeys, and are major ingredients in thousands of the food products we eat?
Corn and soybeans
We are going to figure out what plants need in order for them to make their own food in a process called **photosynthesis**. We’ll start our investigation with an experiment, and then we’ll check on the results of our experiment next week.

**PHOTOSYNTHESIS EXPERIMENT**

*Have the students gather around the plant and explain that they are going to do an experiment. Have four (or more, depending on the number of plants or leaves available) students clip a circle securely on four different leaves. Remind them not to touch the circles until the class comes back to look at them. Return in a week to see what happens.*

*Before class, put the mixing bowl, mixing spoon, cup of water, green construction paper with holes, and flashlight on a table in the front of the room. Draw a blank “recipe card” on the board or flip chart.*

*Have the students return to the plants that have the circles clipped on their leaves. Have the students carefully remove the circles.*

**Do you see any differences in the leaf from when we put the circle on it?**

The area under the circle should be lighter green.

**What do you think caused that?**

Lack of light to that area of the leaf

Let’s go back to the classroom to see how this could happen.

The way plants make food is similar to the way a chef makes bread. It takes a combination of ingredients and someone to mix them. Plant food begins with green pigment in the plants called **chlorophyll**. *(Write “chlorophyll” on the board.)* Chlorophyll gives plants their green color. These are very tiny molecules that act as “solar receptors” and absorb light in the plant. Plants need light to make chlorophyll.

**Have you ever seen a house with solar receptors or panels on it?**

**What do they do?**

They gather light and turn its energy into another form of energy. That is similar to what the chlorophyll does.

**What happened to the leaves that we put circles on?**

The circles shaded the leaves so they didn’t have enough light to make chlorophyll, the green pigment.

**What color were the areas that didn’t have as much chlorophyll?**

Lighter green or yellow

**Do you think the circles on the leaves will turn a deeper green again if we leave the circles off?**

We’ll check it again in a few days and see what happens.

There is a lot more to making plant food than that, though.
Photosynthesis Skit

I need two volunteer chefs to come to the front of the room and mix a batch of plant food in a bowl. (Attach the “Chloro” and “Phyll” name tags on their shirts.)

What are the names of our chefs?
“Chloro” and “Phyll”

Together, what is their name?
Chlorophyll

What color are they?
Green

Where is their kitchen?
In the leaves of plants

“Chloro” and “Phyll” need a recipe to make their tasty plant food. We need one person to write the recipe on the recipe card I have drawn on the board. First, in big letters at the top of the card, write “Plant Food Recipe.”

Phyll, you can add the ingredients. Chloro, you can mix them up. The first ingredient we need in order to make this batch of plant food is water. Write “water” on our recipe. Next to the word water, write the short name for water, which is $H_2O$. This formula name means water is made up of two molecules of hydrogen and one molecule of oxygen. Phyll has some water in a cup to add to the mixing bowl.

Where do you think Phyll got the water from?
Water came into the plant through the plant’s roots, then it traveled up the stem and into the leaves where Chloro and Phyll are making plant food.

The stem is like a straw. We could have Phyll suck the water up through a straw and add it to the bowl, but that would be gross. Phyll, pour the water into the big bowl. Chloro, start stirring very carefully. Water is a precious natural resource. We don’t want to spill any of it.
Now, we need the next ingredient. The recipe says to add **carbon dioxide**. Write “carbon dioxide” on the recipe. Next to the word, write the formula name for carbon dioxide, CO$_2$. This formula name means that carbon dioxide is made up of one molecule of carbon and two molecules of oxygen.

**Where is Phyll going to find carbon dioxide?**
Carbon dioxide is a gas in the air. Air is a natural resource, which means we don’t make it. Actually, people and animals can help us add carbon dioxide to the recipe.

**How can we do that?**
We can breathe into the mixing bowl. What people exhale or breathe out is carbon dioxide. We need just the right amount of carbon dioxide. Four people ought to do it.

**Who wants to come up and blow carbon dioxide into the bowl?**

The carbon dioxide enters the plant through tiny openings in the leaves called **stomata** (*stow-MA-ta*). Pick up the piece of paper filled with tiny holes or stomata and blow through the paper. Chloro, stir the water and carbon dioxide very carefully. It’s important to have them thoroughly mixed.

Chloro and Phyll are missing one last ingredient that causes the water and carbon dioxide to change to plant food. In order to make something change, you need energy.

**Nature has provided the water and air containing the carbon dioxide, but where in nature can we find energy?**

The sun

Phyll, turn on the sun (*a flashlight*). The sun provides light, which is a source of energy. The energy changes the water and carbon dioxide into the plant’s food. Shine that light into the bowl and stir it in. Add the word “light” to the recipe.

**What have we done to make this recipe work?**
We have Chloro and Phyll. They took water from the soil through the roots, carbon dioxide from the air through the leaves, light from the sun through the leaves, and mixed them together. The water and carbon dioxide are changed by the sun and the chlorophyll to make food.

In the directions under the recipe ingredients, write “Chlorophyll mixes the ingredients together to make plant food for one plant.”

**Is there anything left in the bowl?**
Yes.

**What is it?**
We can’t see it, but it’s there. It’s oxygen. When the ingredients are mixed together, oxygen is left over. Plants don’t use oxygen for plant food.

**What do they do with it?**
Similar to the way we exhale carbon dioxide, plants give off oxygen.

**Who needs oxygen to live?**
People and animals need oxygen to breathe. Phyll, tip the bowl out toward your classmates and scrape the oxygen out at them. The rest of the class, breathe in and fill your lungs with oxygen from the plants. Everybody is happy. The plants grow from the food they made, and people have healthy air to breathe.

*Thanks for your help, Chloro and Phyll.*
This process is called **photosynthesis**. (Write “photosynthesis” on the board.) Photosynthesis comes from the Latin words “photo,” which means light, and “synthesis,” which means make something. Chloro and Phyll used light to make plant food from water and carbon dioxide.

**What are the three natural resources needed for photosynthesis to occur?**
Sun, water, air

**What would happen if there were no water, air, or light?**
Photosynthesis wouldn’t happen, and we wouldn’t have food to eat or oxygen to breathe.

Let’s look at the process of photosynthesis using the formula names. It is kind of like a math equation. (Write the following on the board and discuss what each symbol means, whether all the equations mean the same thing, and whether the equations would end up the same if part of the equation was missing or the answer was incorrect.)

\[
H_2O + CO_2 + \text{light} \rightarrow \text{plant food} + \text{oxygen}
\]

\[
\text{Light} + CO_2 + H_2O \rightarrow \text{plant food} + \text{oxygen}
\]

\[
CO_2 + \text{light} + H_2O \rightarrow \text{plant food} + \text{oxygen}
\]

People and animals eat the food made by photosynthesis. Fruits and vegetables store that food. Leaves from herbs also store the food made through photosynthesis. Potatoes are swollen underground stems that store starch, a sugar made through photosynthesis. The starch in the potato tuber is food for the new plant that grows from it. It’s also an important source of food for people.

(Project the lyrics to “Photosynthesis” by Chris Rowlands on a screen or interactive board. Follow the lyrics while you play the song from *Were You Born in a Barn?* by Chris Rowlands. Ask the students where the nutrients come from. They enter the plant in the water coming from the soil up through the roots and to the stems and leaves. Write the new words such as autotrophic, cells, organelles, and chloroplasts on the board and discuss them.)

**PHOTOSYNTHESIS DIAGRAM**

Take out a blank sheet of paper and draw a diagram of the photosynthesis process.

1. Start by drawing yourself or an animal standing next to a leafy plant. (Give them time to draw.)
2. Draw the natural resources needed for photosynthesis.
3. **What does the sun provide?**
   Write “light” under the sun.
   **What could you do if you wanted to grow plants indoors where there are no windows?**
   Grow them under special lights.
4. **How does the plant get water?**
   Through its roots; draw an arrow in the direction the water moves.
5. **What gas is needed by plants?**
   Carbon dioxide
   **Where does it come from?**
   Air, people, and animals; draw arrows from those places to where the plant takes it in.
6. **What gas is given off by the plants as a byproduct of photosynthesis?**
   Oxygen; draw arrows showing where the oxygen is coming from and going to.
**PHOTOSYNTHESIS**

_by Chris Rowlands_

**Chorus**

Photosynthesis is a chemical process
In which plants take things they use
Turn it into food
Energy from the sun, water, CO₂, and nutrients
These are things they use
When they’re making their own food.

Sun shines down on the little plants
Visible light is what they eat
Autotrophic is what they call the plant
They make their own food naturally
From the smallest plant to the biggest tree
They have their own food factory
They give us lots of things we need
Like food and they give us air we breathe.

In the leaves plants have cells
Inside the cells are organelles
Organelles like chloroplast
Are where the sun’s energies are stored and stashed.

In the chloroplasts there still are
Smaller things called chlorophyll
Chlorophyll and chloroplast
Are where the sun’s energies are stored and stashed.

**Diagram of the Photosynthesis Process**
Why do some scientists think that photosynthesis is the most important biological process? It is essential to plant growth because it makes the food that they eat. Plants are the basic source of food, even for carnivorous animals that eat other animals that probably eat plants.

Why is it important for scientists to study the process of photosynthesis? To keep our food supply going. In some cases, plants are used to produce more oxygen, which is a byproduct, or it comes from the photosynthesis process.

PLANTS AND ANIMALS AS PARTNERS

Are plants, animals, and people good partners? Yes.

Let’s make a list of all the things that people, animals, and plants do for each other. Work in small groups to discuss one of these relationships: what plants do for animals, what animals do for plants, and what people do for plants and/or animals. Have someone in your group be the recorder and write down all the things your group comes up with. Someone else from your group will report your ideas to the class. (Give them ten minutes for discussion in their groups. As you hear each group’s report and discuss it, have a student write the ideas on the board in the appropriate column.)

<table>
<thead>
<tr>
<th>What plants do for people and/or animals</th>
<th>What animals do for plants</th>
<th>What people do for plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Give us oxygen</td>
<td>Give them carbon dioxide</td>
<td>Give them carbon dioxide</td>
</tr>
<tr>
<td>Give us food</td>
<td>Fertilize the soil (manure)</td>
<td>Cultivate them</td>
</tr>
<tr>
<td>Give us clothing (cotton)</td>
<td>Move their seeds</td>
<td>Sow their seeds</td>
</tr>
<tr>
<td>Give us shelter (wood)</td>
<td>Thin out populations by</td>
<td>Protect them from animal</td>
</tr>
<tr>
<td></td>
<td>eating plants</td>
<td>grazing</td>
</tr>
</tbody>
</table>

RESOURCE


**WATERING GARDEN PLANTS Science Page**

---

**TO WATER OR NOT TO WATER?**

In most areas, rain alone does not meet all the water needs of garden plants. You need to water the garden.

The soil in raised beds dries out faster, so we have to water more often.

At least these beds drain well. If the soil were compacted, the water would not drain and the plant roots would drown.

The soil is dry all the way down to the depth of the plant roots. It’s time to water.

You need to add enough water so that it seeps all the way down to the plant roots. If you just water the soil surface, the roots will grow close to the surface and then the plants will wilt more quickly.

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**WATERING METHODS**

1. A watering can and hose are useful for small gardens.

I’m using a gentle rain nozzle so the water can slowly soak into the soil.

Direct the water to the base of the plant, not on the leaves.

I’ll move the sprinkler around to other spots so all the garden gets enough water.

3. A drip or trickle irrigation system applies water directly to the area in the soil where roots are growing.

Many farmers in hot, dry places use drip or trickle irrigation.

Little water is lost to evaporation or run-off when you use the drip or soaker hose methods because the water goes into the ground near the plant.

The gentle stream of water causes little or no compaction of the soil.

4. A soaker hose is a plastic or canvas hose with holes all along its length. It is placed along one side of plants or underneath mulch. Water seeps out slowly.

---

**SAVING WATER IN THE GARDEN**

Make the most of available water in the garden.

Collect rain water from roof-tops in rain barrels. Keep the rain barrel covered to prevent mosquitoes from breeding.

Add organic matter to the soil. It holds the water, which then can be used by plants.

Water during early morning. At this time temperatures are cooler and it is less windy, so there is less evaporation.

Cover the soil with mulch, which smothers weeds and allows water to seep slowly into the soil. A mulch cover also reduces evaporation of water from the soil.

Garden Mosaics is funded by the National Science Foundation Informal Science Education program, and by the College of Agriculture and Life Sciences at Cornell University.
CROSSWORD PUZZLE

Across
1. Water in the ______ when it is cooler.
4. This type of irrigation system applies water directly to the roots of plants.
7. Watering with a gentle stream of water causes little ______.
9. Farmers in hot, dry countries use this method of watering.
11. A hose with holes all along its length is called a _____ hose.

Down
2. Add _____ matter to soil so that the soil will hold more water.
3. They waste a lot of water to evaporation.
5. Use a gentle _____ nozzle for watering plants.
6. Gardeners can collect rain in rain ______.
8. _____ will help reduce evaporation from the soil surface.
10. When watering add enough water so it seeps all the way down to the ______.

TRY THIS
DRIP IRRIGATION FOR GARDEN PLANTS
What you need
* plastic one-gallon milk jugs
* clothespin with spring
* pin
* candle
* matches

What to do
1. Light the candle. Use the clothespin to hold the pin. Place the sharp end of the pin in the candle flame until it is hot. Use the hot pin to melt about 8 to 10 small holes in the bottom of the milk jug. CAUTION: Do this only under the supervision of an adult.
2. Put some water in the jug to make sure the water will slowly drip out of it.
3. Bury the milk jug between widely spaced plants in the garden, such as tomatoes, peppers, eggplants, or squash. The bottom 15 cm of the jug should be buried (see picture).
4. Fill the jug with water every few days during dry spells.
5. Observe how well the plants near the jug grow, compared to plants without drip irrigation.

SPOTLIGHT ON RESEARCH
Dream up a watering invention
Can you think of a creative irrigation idea for gardeners and small farmers? Each year the World Bank and the United Nations sponsor a contest to promote irrigation systems for small farmers and gardeners. The irrigation systems must be affordable, creative, easy to operate, and useful in many areas around the world.

One of the contest winners was a “Dream Kit” for drip irrigation, designed by Stephen Ngigi at the University of Nairobi in Kenya. The Dream Kit consists of a bucket mounted on a wooden stand above the ground. The bucket is connected to pipes with tiny holes in them, through which water drips out along a row of crops. In dry areas, the bucket is filled twice a day. Thanks to the Dream Kit, small farmers in Kenya have been able to grow much needed vegetables to sell and to eat. The kit can easily be put together and repaired by farmers, and costs only U.S. $15.00. Within three months, farmers can make four times this much by selling crops that would otherwise be difficult to grow. The Dream Kit truly deserves its name!


RIDDLE
Where do vegetables go to have a drink? Answer: A salad bar!
WATERING GARDEN PLANTS Teaching Tips

LEARNING OBJECTIVES
Youth will be able to:
* Explain when and how much a garden should be watered.
* Describe several different watering methods that can be used in a garden.
* Evaluate watering methods to determine which is most suitable for a given situation.
* Explain how to conserve water in the garden.

HOW TO USE THE WATERING GARDEN PLANTS SCIENCE PAGE

Have youth do a survey of watering techniques being used in the community garden. Find out where the water comes from and how gardeners transport it to their gardens. Observe how and when crops are being watered and compare their vigor. For example, look for different types of drip irrigation systems, including both homemade and store bought devices. Observe how the plants are doing under these watering systems. Are they being watered enough, and in the right way?

Look for plants that appear wilted and stunted because of lack of water. Try to figure out why they are stressed. Are they getting enough water? Is there enough organic matter in the soil? Are plants being mulched?

Look for techniques being used to conserve water. For example, do gardeners collect water in rain barrels? Do they add organic matter and mulch to their soil?

Youth may want to visit several gardens and possibly a farm or university agricultural experiment station to learn about different watering methods. They may also want to do research about watering techniques on the internet. Go over the general watering tips below with the youth. After youth have learned about watering methods for gardens, have them discuss what recommendations on watering they would give to gardeners. They may wish to draw a poster to illustrate their recommendations, and post it in the garden. Or they may want to make a poster on watering for children and other visitors to the garden.

Here are a few tips that many gardeners could use to improve water use in the garden. Water infrequently, but thoroughly. Frequent shallow watering causes plant roots to concentrate close to the surface, making the plant more susceptible to water stress. How often you must water depends on many factors, including the type of soil you have (sandy soils need watering more frequently than do clay soils), how much organic matter and mulch is present (soil without mulch or organic matter dries out faster), whether or not you have raised beds (raised beds tend to dry out faster), and the weather (obviously, you have to water more often in hot, windy, dry weather, and less often in rainy weather). Generally, unless the weather is very hot and windy, about 2 1/2 centimeters (1 inch) of water per week is adequate for most garden plants. To find out how much rainwater the garden is getting, you can place a straight-sided can in the soil, and then measure how much water is in the can after a rainstorm. If the garden is not getting 2 1/2 centimeters of rain, then you need to make up the difference by watering.

To find out for sure if you need to water, check the soil to the depth of the roots (at least 60 cm deep for tomatoes, pumpkins, winter squash, sweet potatoes, and watermelon; at least 45-60 cm deep for beans, beets, carrots, cucumbers, peas, peppers, and summer squash; at least 30 cm for cole crops, corn, lettuce, potatoes, radishes, spinach, and berries). 2 1/2 centimeters of water will penetrate to a 38 cm depth in a loam soil.

CROSSWORD PUZZLE

Answers
Across: 1. morning; 4. drip; 7. compaction; 9. trickle; 11. soaker.
Down: 2. organic; 3. sprinklers; 5. rain; 6. barrels; 8. mulch; 10. roots.

TRY THIS

This is a very simple drip irrigation device that works well for widely spaced plants in the garden. Youth should observe that crops irrigated with this device are more vigorous and have higher yields, compared to crops that are not watered during dry spells.

SPOTLIGHT ON RESEARCH

Got Dirt?

Garden Toolkit for implementing youth gardens
For more information about this garden toolkit contact:
Nutrition, Physical Activity and Obesity Program
Division of Public Health
P.O. Box 2659
Madison, WI 53701-2659
Phone: (608) 267-9194
Fax: (608) 266-3125
Email: amy.meinen@wisconsin.gov
Website: http://dhs.wisconsin.gov/health/physicalactivity/index.htm

This garden toolkit was made possible by funding from:
Centers for Disease Control and Prevention Obesity Prevention Grant:
This publication was supported by Cooperative Agreement Number U58/DP001494 from the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not represent the official views of the Centers for Disease Control and Prevention.
Caring for the Garden

1. Thinning Seedlings: Once your seeds have begun to sprout and grow in the garden, pull out the extras to provide growing space for the remaining plants. Make sure to remove the extras when the plants are still small, before they compete with others for light, air, and water. When fruits and vegetables grow too close together, the plants growth may be stunted, root crops become distorted, and vine crops grow poorly due to self-shading.

2. Weeding: If you keep weeds out of your garden, you’ll have a better harvest! Weeds compete with your plants for water, light, and nutrients. Weeds also encourage insects and diseases that attack your garden plants. Mulch and cultivation can help keep the weeds in your garden under control. Use organic materials such as grass clippings (from a non-chemically treated lawn) or a good weed-free straw, specifically clean wheat or rye straw, as means for controlling weeds in your garden. Old newspapers combined with a top layer of grass clippings can be placed around and in between plants to provide an excellent barrier for weeds. The coarser the material, the thicker the layer of mulch.

Quick Tip
Check the Weather Forecast! View the Gardener’s Local Forecast, courtesy of The Weather Channel. Check here www.weather.com/activities/homeandgarden/garden/ and enter your zip code to find out if you’ll need to water your garden today.
3. Watering: The best time to water is in the early morning or early afternoon. This allows the leaves to dry off before nightfall, reducing the chance for disease. Drip irrigation or soaker hoses can be used to keep plants dry during watering, which also reduces the chance of disease infection. However, drip irrigation can be done anytime during the day if used under newspaper, straw, or grass mulch. Some plants, like tomatoes, do not like their leaves wet. In this case drip hoses work especially well. Note: Watering between 10:00 am and 2:00 pm could burn the plants, unless it is an overcast or cloudy day.

5. Adding Organic Matter: “Organic matter” provides nutrients for plants. Plants take food from the soil as they grow, so organic matter needs to be applied yearly. Some organic matter sources include: well-rotted cow or horse manure, compost made from tree leaves, lawn clippings (without chemicals), garden refuse (disease-free), green manure, and other organic residues. It is important to keep in mind that some fruits and vegetables are “heavy feeders” (i.e. corn and tomatoes), while others are not (i.e. green peppers). It is best to incorporate organic matter in the fall or early spring, as you prepare the garden soil.

At the Ho-Chunk Youth Fitness Garden, we found that a layer of leaf mulch did a great job of keeping the weeds down; especially around the squash, pumpkins, and vine plants.

— Roxanne Lane
Master Gardener
Sauk County
6. Integrated Pest Control Management
   a. Purchase Quality Seeds & Plants: Start by selecting healthy plants or seeds from reputable seed companies and nurseries. There are several different disease-resistant varieties of seeds you can purchase.
   b. Plant Spacing: Leave plenty of distance between plants to provide air movement, which reduces the chances for diseases to begin.
   c. Plant Appropriately: Setting plants out too early or late can make them weak and more susceptible to a pest attack.
   d. Set up Barriers: Use physical barriers between the plants and the pests by using row covers or nets that allow the sunlight and water to penetrate, but keep out pests. The barrier DOES have to be in place before the pest appears. Remember to remove the barriers during the blossoming stage so that insects will be able to pollinate the plants.
   e. Pick the Pests: Hand-pick and destroy insect pests.
   f. Prevent Weeds: A layer of mulch helps to control weeds and conserve soil moisture. A garden full of weeds is a major attraction to pests!
   g. Learn to Look: Monitor your garden weekly for any new pests. Regularly inspect your plants and their leaves for any trace of insect feeding, etc.
   h. Keep it Clean: After you have harvested everything from your garden, discard any diseased plant material from the site. Remove debris as soon as possible, as many pests will remain over winter in or under dead plant material. Plow or till the garden in the fall.
   i. Rotate Crops Next Year: Move crops to different garden locations each year to reduce buildup of plant-specific pests in the soil.

For more information for controlling diseases in your garden, visit the following websites:

- The Insect Diagnostic Lab, UW-Madison, Department of Entomology: www.entomology.wisc.edu/entodiag.html
- The Plant Diseases Diagnostic Lab, UW-Madison, Dept. of Plant Pathology: www.plantpath.wisc.edu/pddc
- University of Minnesota Extension Service: Controlling Diseases in the Home Vegetable Garden www.extension.umn.edu/gardeninfo
- Ohio State University yard and garden pest information: http://ohioline.osu.edu/hyg-fact/2000/
7. Keep the Beneficial Insects: Over 90% of insects around the garden are harmless to people and plants. Without the help of these “beneficial insects”, most plants would be overrun with pest insects every year. These beneficial insects feed on many different pest species. Furthermore, several of these beneficial insects are pollinators. With more pollination taking place, more high quality fruits and vegetables can be produced. To keep beneficial insects around your garden, limit or eliminate pesticide use. Consider leaving flowering weeds around the garden (i.e. dandelions and clover) to provide alternate nectar sources for pollination. To have beneficial insects attracted to your vegetable garden, be sure to add some flowers and herbs. Examples of annual flowers that attract pollinators include alyssum, marigolds, nasturtiums, dill, and cosmos.

8. Mulching: Mulching with untreated, chemically free grass clippings, leaves, or straw in late June provides several benefits. The mulch will help to suppress weeds, conserve soil moisture, prevent compaction of soil by heavy rains, and add more organic matter to your soil.

For Additional Resources on Composting:
- Wisconsin Department of Natural Resources: Recipes for Composting: http://dnr.wi.gov/org/caer/ce/ee/earth/recycle/compost_waste.htm
- Iowa State University Horticultural Guide: Composting Yard Waste www.extension.iastate.edu/Publications/PM874.pdf

For Answers to General Gardening Questions, Visit These Websites:
- University of Wisconsin Urban Horticultural Website http://wihort.uwex.edu/
- University of Wisconsin Extension-Milwaukee County Yard & Garden Line (Milwaukee County Residents only) www.uwex.edu/ces/cy/milwaukee/hort/consumer/HortLine.cfm

how can I engage youth in gardening?

Getting youth interested in gardening is easy — just provide a safe location, a hand trowel, some seeds and plants, and a volunteer to show them what to do — kids love learning how to grow things. Start small, either with a container garden or a small raised bed no larger than 4 x 4 feet. Square foot gardening is a technique that works well with kids. Have them map out their one foot squares and choose which plants they want in each square, then have them post their map at the garden while they plant. Caring for their garden and watching it grow will be a delight.

— Patti Nagai
UW Horticultural Agent, Racine County
What are Action Projects?
Action Projects often serve as the culmination of a longer-term Garden Mosaics program. Youth apply what they have learned through the *i-m-science investigations* and other activities to help gardeners and their community. Action Projects can also be conducted as stand-alone projects, or in conjunction with other civic and environmental education programs. Whatever way you conduct Action Projects, be sure to have youth submit the online *Action Project Form* so that others can learn about and be inspired by their accomplishments.

You can use Action Projects to motivate youth who want to do more than learn about the neighborhood, garden, and gardeners. Many older youth want to do something meaningful for the gardeners, to create something beautiful for the garden, and to answer questions about gardening that come up during the *i-m-science investigations*.

Action Projects are carried out in cooperation with the gardeners and other neighborhood adults. They vary widely, depending on the type of youth program, and the interests of the youth and adults. For example, youth at a summer art camp can make sculptures for the garden, or youth in a community action program could meet with elected officials to explain the importance of community gardens to their neighborhood. Youth choose an Action Project related to Art in the Garden, Food Systems, Garden Design, Garden Enhancement, Garden Research, Land Use, or Nutrition and Health.
ACTION PROJECTS

Action Projects allow you to make a difference in your community. You can design your own Action Project based on what you have learned from the gardeners and what interests you.

SOME IDEAS FOR ACTION PROJECTS

DESIGN!

We made this garden plan with people at the community center.

CREATE!

Let's paint a mural on that wall!

BUILD!

When this path is finished, people in wheelchairs will be able to reach their garden plots more easily.

CELEBRATE!

We helped the gardeners grow and cook this food.

PRESENT!

We're going to tell you about our community garden and how it helps our neighborhood.

PUBLISH!

This recipe sounds healthy... and good to eat!

We put your favorite collards recipe in the book.

EDUCATE!

Look at this sign!

It's one of many we made to help explain about the plants growing in the garden.

EXPERIMENT!

This experiment may help gardeners control garden weeds.

Garden Mosaics is funded by the National Science Foundation Informal Science Education program, and by the College of Agriculture and Life Sciences at Cornell University.
ACTION PROJECTS

WHAT TO DO

1. Do Background Research
   ✓ Read some of the Action Project reports on the Garden Mosaics website.
   ✓ Discuss what you have learned about the gardeners and the neighborhood.

2. Decide what to do
   ✓ Discuss your ideas with the gardeners.
   ✓ Fill out the Action Project Planning Form.
   ✓ Discuss the steps you will take and who will be responsible for what.

3. Do it
   ✓ Carry out your Action Project.

4. Tell others about your Project
   ✓ Share the results with gardeners and other community members.
   ✓ Describe your Action Project using the Online Action Project Form and submit it to the Garden Mosaics website.

Garden Mosaics is funded by the National Science Foundation Informal Science Education program, and by the College of Agriculture and Life Sciences at Cornell University.
Conducting an Action Project

Ideas for Action Projects
You and your group can choose an Action Project in any of these areas. You can view actual examples of Action Projects that other groups have completed on the Garden Mosaics website (www.gardenmosaics.org).

Conducting an Action Project

Choose the Project

1. At the start of your project, let the youth know they will be doing an Action Project. They will use what they learn from their interviews and observations in the gardens and neighborhood to plan the project.

2. Have the youth read about other groups’ Action Projects on the Garden Mosaics Action Projects online database.

3. Decide on the general topic of the Action Project. You can make this decision before the youth program starts. For example, if you are running a summer science program, you can decide that the Action Project will focus on garden research.

We have included guidelines for Action Projects in the following areas:
- Art in the Garden
- Food Systems
- Garden Design
- Garden Enhancement
- Garden Research
- Land Use
- Nutrition and Health

Land Use
Create a green map of your neighborhood, or talk to elected officials about the value of community gardens.

Garden Research
Conduct a planting experiment, internet research, soil measurements, or observations in the garden.

Art in the Garden
Make an art object with a gardening theme and present it to the gardeners at a gift-giving ceremony.

Food Systems
Celebrate the garden harvest, research aspects of the local food system, or create a neighborhood food map.

Garden Enhancement
Plant flowers, construct interpretive signs, or build a wheelchair-accessible raised bed.

Nutrition and Health
Host a garden banquet using foods from the garden, or make a cookbook from gardeners’ recipes.

Garden Design
Design a new garden for your school or community center.
4. Help the youth decide on the specific Action Project based on the results from their im-sci investigations. If you will be conducting a Garden Research Action Project, during the im-sci investigations the youth should ask the gardeners what information they might need about plants, insects, soils, and related areas. The youth can conduct research to answer the gardeners’ questions and report back to the gardeners what they discovered. Or if you will be conducting an Art in the Garden Project, the youth should ask the gardeners about their interests in garden improvements and be on the lookout for an area of the garden that could be “spruced up,” such as a fence that would look nice with a mural painted on it. In addition to taking into account the gardeners’ input and the youth’s own observations, you will need to make sure the project is feasible given the time and resources available to your group, and the youth’s ages and abilities.

Plan for the Project
5. Have the youth complete the Action Project Planning Form. Included in the plan should be the objectives, steps needed to reach each objective, background information needed, materials needed, the role of each member of the group, how they will involve gardeners and others (e.g., scientists, artists), and how they will present their project.

Collaborate with Others
6. Discuss ideas for the Action Project with the gardeners to see if the plan addresses the gardeners’ interests. The youth may revise their ideas based on these discussions.

Understand the Science Related to your Project
7. Use the Science Pages and other resources to help the youth understand the concepts and skills necessary to conduct the project. Have the youth conduct the activities on the Science Pages and guide them in a discussion to make sure they understand the concepts.

Conduct the Project
8. Have the youth conduct the Action Project, including taking photos (See Photo Guidelines, Section VII).

Share your Results
9. Have the youth present their results to gardeners and other community members.

10. Have the youth describe their Action Project using the online Action Project Form and submit their form and photos to the Garden Mosaics website.
Art in the Garden Action Projects

Youth can create any number of art objects to give to gardeners for their Art in the Garden Action Project. For example, they might create mosaics from tile fragments, paint a mural, or make paper from plant fibers. They could build a scarecrow, install bird houses, make dye from garden plants, or create a photographic display of the garden. Other possibilities include making a book of plant sketches or pressed plants found in the garden. The youth should ask the gardeners what kind of art they might enjoy and use this information to decide on their Art in the Garden Action Project. Although the examples here come from community gardens, you should be able to adapt them for home or school garden or other youth programs.

Ideas for Art in the Garden Action Projects

- Create a “Garden Mosaic” from tile fragments
- Make birdhouses and bat houses
- Create or decorate container plantings
- Make paper from plant fibers
- Create a collection of pressed plants
- Make dyes using plants from the garden
- Create a photo book of the garden
- Paint a mural along a fence
- Build a scarecrow
- Make a sketchbook of garden plants
Example Projects
Following are example Art in the Garden Action Projects. Our intent here is to give you a range of possibilities, which we hope will prove useful as you help youth develop their own project.

Create a “Garden Mosaic” from Tile Fragments
The youth notice that the path in front of the garden shed is dusty and no longer has grass. They think it would be nice to put in stepping stones or a short brick path. They discuss their idea with the gardeners and talk about possible materials. They find out that the gardeners have a pile of salvaged bricks that they could use. The youth decide to create colorful mosaics on the bricks by joining the tile fragments with grout and attaching them to the brick with a tile adhesive. They contact a local plumber and a home improvement store and learn that they have a large quantity of broken tile fragments. The youth then arrange the bricks in front of the shed to see how the path will look and dig out the area for setting the bricks. They dig about an inch deeper than the bricks so that they can place a layer of sand to create a more level surface. Then they adorn the bricks with mosaics and set them in the ground.

Make Paper from Plant Fibers
The gardeners are very helpful and generous of their time during the i-m-science investigations. The youth hold a brainstorming session to think of a gift that they could make for the gardeners as a sign of their appreciation. During the session, they decide to make paper using the garden plants. They research paper making from plants on the Internet. They ask the garden manager for permission to use a few of the hollyhock plants in the common area. They use the stems of the hollyhock along with other fibers and materials as the ingredients for their paper. Once the paper is made, they present it to the gardeners as a gift.

Build a Scarecrow
During the i-m-science investigations several gardeners mention that squirrels and certain birds feed on their corn, sunflowers, and fruit trees. This is particularly a problem at harvest time. The youth think it might be neat to make scarecrows. After doing some Internet research, they find that there are many different types of scarecrows and just about any old material can be used. When they talk to a local Cooperative Extension agent they learn that scarecrows can sometimes be effective and are worth trying. They talk with the gardeners about their idea and the gardeners think that a few scarecrows that are put up during the growing season would be useful. The youth hold a scarecrow making day in the garden.
Create or Decorate Container Plantings
During the Neighborhood Exploration, the youth notice a construction site that is throwing out old planter boxes and a sink. They talk about how these materials could be used for container plants and decide to share their ideas with the gardeners. The gardeners are not interested in the old sink (although several gardeners think it would be fun, the garden manager does not approve). However, they think that if the youth decorated the planter boxes, they would look nice by the shed. The youth decorate the boxes and plant flowers in them.

Make Dyes Using Plants from the Garden
When the youth interview one of the gardeners during the Gardener Story, they learn that she enjoys knitting and used to dye her own wool. The gardener offers to teach the youth how to make dye from plants. With the help of the gardener and a book from the library, the youth make several different colored dyes from garden flowers. The group dyes some cotton fabric to make a table cloth for the picnic table in the garden.

Create a Photo Album of the Garden
During the Neighborhood Exploration, the youth enjoy using cameras and creating a photo collage. They decide they would like to make a photo album of their activities, the gardeners, and the changes in the garden over the summer. At the end of the summer, they present the photo album to the gardeners.

Make a Sketchbook of Garden Plants
Several of the youth enjoy drawing. The group decides to create a poster of drawings of garden plants to give to the gardeners as a gift of appreciation. They talk to a local artist about scientific drawings. At the end of the program, they present their poster to the gardeners.

Make a Collection of Pressed Plants from the Garden
During the Gardener Story, the youth learn that the gardeners would love to have children carry on their gardening traditions, but the children do not even know the names of the plants. The youth decide to create a book of pressed plants from the garden, labeling the plants and pointing out identifying features. They talk to a local botanist about the best way to press plants. They also copy the relevant Science Pages describing the different plants and include the copies in the book. They give the book to the gardeners to use when children visit the garden.
Build Bird Houses and Bat Houses
The garden manager mentions during the Community Garden Inventory that the garden used to have a bird house but it had to be taken down because it was falling apart. The gardeners say they would like to attract more birds and even bats to keep down the mosquitoes in the garden. The youth decide to make and install bird and bat houses. They research bird and bat houses on the Internet and contact a technology teacher who is willing to help with the project. The youth construct the houses and present them to the gardeners at a final garden celebration.

Create a Mural
During the Community Garden Inventory, the youth observe that the fence bordering the garden is covered with flaking paint and old graffiti. They talk with the gardeners about creating a mural and secure permission of the property owner to paint on the fence. The youth next search the Garden Mosaics website for photos of other community gardens with murals. They also look at Science Pages to get ideas for garden science concepts that might be displayed on a mural. They then contact a local artist and art teacher to help them work with the gardeners to sketch out a plan for the mural. Finally, they hold a mural day during which the youth and gardeners paint the pictures on the fence.
Food Systems Action Projects

In the Food Systems Action Project, youth learn about our complex, modern day food system, starting at the local level. For example, they may create a neighborhood map showing sites where residents can buy or grow food. Or they could arrange for extra garden produce to be donated to a soup kitchen. Another possibility would be to conduct a garden produce taste testing party for children and their parents. The youth’s conversations with the gardeners and observations in the neighborhood during the *i-m-science investigations* will help them define their Food Systems Action Project. Although the examples here come from community gardens, you should be able to adapt them for home or school garden or other youth programs.

Ideas for Food Systems Action Projects

- Help establish a local produce stand
- Find out how much money gardeners save by growing their own produce
- Write a letter to school officials asking to include more local produce in school lunches
- Create a neighborhood food map
- Conduct a survey of neighborhood residents about access to fresh produce
- Host a "local harvest" banquet
- Conduct a vegetable taste testing party for children
- Arrange for extra garden produce to be donated to a soup kitchen
Example Projects

Following are example Food Systems Action Projects. Our intent here is to give you a range of possibilities, which we hope will prove useful as you help the youth develop their own project.

**Produce Stand**

Youth learn during the **im-science investigations** that there are few places to buy vegetables in the neighborhood. During the Community Garden Inventory, several of the gardeners mention that they would be interested in selling their produce at a Saturday market. Similarly, several neighborhood residents visiting the garden mention that they would like to buy fresh produce. The youth meet with staff from local government agencies and non-profit organizations that work on food systems issues, and ask for advice on how they could start a produce stand. They work with the gardeners who are interested in selling produce and arrange for permission to have a stand in the neighborhood. The youth assist the gardeners with their stand by helping to harvest vegetables, make signs, and sell the produce. This activity is recommended for older youth and young adults.

**Neighborhood Food Map**

Youth learn during the **im-science investigations** that the gardeners obtain most of their produce from the garden. They are curious about how other residents in the neighborhood obtain food, especially fresh vegetables, and decide to create a map of all the places in the neighborhood where residents could obtain fresh food. To make their map, the youth walk through the neighborhood, taking notes and photographing places food is purchased (e.g., stores, green markets, or corner stands), grown (e.g., backyard, community, or school gardens), and distributed (e.g., soup kitchens). The youth visit several convenience and grocery stores along the route to ask about the produce and see if it is fresh. They then create a map/photo collage that highlights the places where food is available in the neighborhood. They laminate the map and give it to the gardeners, along with a presentation about their findings.

**Food Systems Research**

The youth are surprised when they learn how much produce the gardeners grow and wonder how much money they might be saving. The youth decide to conduct a study to determine the cost of the garden grown vegetables if purchased in local markets. They talk with the gardeners and create a list of the most commonly grown vegetables. They also ask the gardeners to estimate the amount produced of each vegetable. The youth then divide the list so that each person is responsible for finding out the cost at the local market of one or two vegetables. For each vegetable, the youth determine the amount of money saved by multiplying the amount the gardeners produce by the price in the store. They organize their results in a table and make a presentation to elected officials about the value of food produced in the garden to local residents.
Taste Tests
During the im-science investigations, the gardeners share their produce and the youth are surprised to learn how good fresh vegetables taste. The gardeners express concern that young people have poor diets and do not appreciate fresh vegetables. The youth decide to conduct a taste testing party for children from the neighborhood. They buy tomatoes from the store and help the gardeners harvest several tomato varieties from the garden. They then make a list of the different tomatoes and give each one a number. Next they cut up the tomatoes into small pieces and place them on plates with their numbers. (The children should not know which tomatoes are from the store and which are from the garden.) The children then taste each tomato, and vote on the tomato they like best. The youth share information on the importance of nutrition and eating healthy foods with the children. The gardeners then share tomatoes with the children to take home to their families.

Letter Writing
During their visits to the garden, the gardeners share tomatoes, squashes, and other fresh vegetables with the youth. These vegetables taste far better than those in the store or in school lunches. The youth feel that schools, nursing homes, and other institutions should be serving more fresh and locally grown produce. They write letters to their school administrators to emphasize the importance of fresh, locally grown food and request the use of more of these foods in their cafeterias.

Sharing the Harvest
The gardeners are always sharing their produce with garden visitors, including the youth. The gardeners mention that although they take home produce and share it with friends and family there is always more than they can use. The youth ask the gardeners if they would be interested in sharing their harvest with an organization that serves meals to the hungry. The gardeners are open to this possibility and the youth find a church soup kitchen that is interested in donations of fresh produce. They work with the gardeners and the church staff to arrange the donations.

Food Access Survey
The gardeners appear to get most of their produce from the garden. However, the youth are wondering if there are fruits and vegetables that the gardeners purchase instead of grow. Where do they go to buy them? Also, where do people in the neighborhood who do not garden go to get their produce? The youth decide to create a survey for the gardeners and neighborhood residents that asks these questions. They contact a social studies teacher to help design and implement the surveys. They compile their results and host a presentation to share their information with the gardeners and community residents.

Local Harvest Celebration
The gardeners grow a diversity of vegetables and the youth have enjoyed the opportunity to try some unfamiliar foods. They decide that it would be fun to have a celebration featuring food grown in the garden, as well as other locally grown fruits and vegetables. They learn from their local Cooperative Extension that many foods, such as apples, are grown just outside the city limits. The youth visit the city’s Saturday Farm Market to learn about local produce and how it is grown. They share their findings with the gardeners and get permission to host a celebration for the gardeners and neighborhood residents. They use the Science Pages and the Internet to print out information on the different fruits, vegetables, and herbs they will feature. They then buy produce at the Farm Market and help the gardeners harvest their own produce. For the celebration, they set up tables for people to sample the different foods, and to read about how and where the foods are grown. Everyone enjoys the bounty of the region!
Garden Design Action Project

Introduction
A Garden Mosaics group in Sacramento CA, under the leadership of Ann Marie Kennedy and Daniela Tavares, contributed this Action Project. The Sacramento Garden Mosaics youth discovered that there was a long waiting list to get plots at a local community garden. They decided to design a garden at their school and to provide plots for community members. To help design the new garden, they interviewed gardeners at the existing garden.

Through the Garden Design Action Project, youth use landscape architecture methods to create a design for a new garden. For example, youth may want to create a plan for a school garden or a garden next to a community center. Regardless of where the youth build the garden, you should obtain permission from the necessary authorities.

It is important for youth to learn from experienced gardeners about considerations in designing a garden. You can adapt the Garden Hike Investigation to incorporate questions that will be helpful in designing a new garden. This will allow the youth to see what kinds of things are important to gardeners and to get ideas about their own garden.

Occasionally, the youth may have the opportunity to work with gardeners to redesign an area in an existing community or home garden. If this is the case, you can adapt the Garden Hike to include questions about the needs of the gardeners already in the garden. The garden manager should be able to help you determine whether there might be any interest in redesigning part of an existing garden.

In addition to learning about the needs and interests of existing gardeners, it is important to learn about the ideas others who might use the garden. Landscape architects call this step "Client Needs." For example, in the case of a school garden, it will be important for the youth to talk to teachers, school officials, and other students to find out about their interests and what is possible at the site.

Unlike the other Action Projects where we present several ideas and a general framework for completing the project, here we include a set of steps that landscape architects use when they are designing the garden. After determining client needs and interests, landscape architects describe the existing site, including taking measurements and photographs and making sketches of plants and other features. Finally, they create their garden plan, which includes creating a design, drafting the plan, and making the final master plan. Thus, the steps in a Garden Design Action Project are:

Client Needs and Interests
1. Garden Hike
2. Other Client Needs

Site Description
3. Measuring the Site
4. Taking Photographs
5. Photo Collage
6. Sketching

Garden Plan
7. Design Charette
8. Draft Plan
9. Master Plan

Before starting the Garden Design Action Project, have your youth pay a virtual visit to the Sacramento Garden Mosaics page, which has photos of youth designing a new garden based on what they learned from community gardeners.

The Garden Design Action Project was written by Daniela Tavares, with assistance from Ann Marie Kennedy.
Clients Needs and Interests
Client Needs and Interests involves learning about what gardeners and other “clients” like about gardens in general and what they would like to see in the new garden.

1. Garden Hike
When conducting the Garden Hike as preparation for the Garden Design Action Project, the youth should pay particular attention to documenting any unique and cultural planting practices. Follow the instructions for the Garden Hike with the following modifications.

Preparing Youth for the Garden Hike
In the pre-activity discussion, describe how other youth and garden designers have interviewed gardeners to gain an understanding of the garden site. (See Sacramento Garden Mosaics page). Ask the youth in your group:

• Why do designers need to know about the people who will use the garden?
• How can interviewing an older person help better design the garden?
• How can observing the characteristics of a garden help us to understand the history and customs of gardeners and other people who might use the garden?
Next ask the youth to brainstorm a list of questions for the gardeners that will be useful in designing a new garden or area of a garden.

Conducting the Garden Hike
During the interview, point out how what the gardener is saying might be related to designing a garden.

After the Garden Hike
The youth also may want to incorporate questions that would be useful in designing a new garden into the Gardener Story. Have the youth make drawings to visually record their notes from the Investigations.

2. Other Client Needs
Once the youth have learned about what is important to gardeners, they should make a list of other people who might use the new garden. They should brainstorm a list of questions for these individuals (for example, What kinds of plants do you like? Is there a way to design the garden so it is more accessible for you?). The youth should interview the other users to determine the answers to their questions.

Site Description
The site description involves four activities: (1) measuring the dimensions of the site where the youth will design the garden; (2) taking photographs of the site; (3) compiling the photos into a collage showing areas that meet and do not meet the gardeners’ and other users’ needs; and (4) identifying and drawing sketches of garden plants.

3. Measuring the Site

Time Needed
• Before meeting with youth: variable depending on time needed to obtain aerial photograph and base map
• Preparation with youth: 30 minutes
• Activity in garden: 2 hours
• Discussion: 30 minutes

Materials
For each group of youth:
• Aerial photograph of the site
• Base map of site or grid paper
• Measuring tape (100-200 ft or 30-60 meters)
• Clipboards
• Markers and pencils

Procedure
• Before Meeting with Youth:
1. Obtain an aerial photograph of your site. If your group is too large to gather around the aerial photo, make an enlargement or make laser color copies of the photo for the youth.
2. If possible, obtain copies of a base map of the garden. School officials will likely have such maps for school grounds. For community gardens or vacant lots, these may be available through the gardeners or the city.
Reduce the original base map to fit on 8.5” x 11” paper. This will provide youth with the outline of the site and allow them to easily draw and label structures or other components of the garden onto the map.

3. If you are not able to obtain an existing base map, draw a rough outline of the site on paper and copy for the youth. Alternatively, draw an outline of the site on a chalk board, and provide the youth with grid paper to draw their own outline of the site.

• Preparing Youth:
  1. Pass out copies of aerial photographs of the garden or have the youth gather around one enlarged airphoto. Help the youth identify landmarks surrounding the garden (e.g., tall buildings, parking) and the borders and entrance to the garden. Point out North and other directions on the airphoto.

  2. Pass out the base map of the garden and help the youth label key landmarks, such as the entrance, on the map. If you don’t have a base map, have the youth draw the border and entrance of the garden on the grid paper.

  3. Divide the youth into teams of three (one note taker and two measurers) to take measurements and photos in the garden.

• Conducting the Activity:
  1. Remind youth that they should be respectful and non-disruptive inside the garden. They should explain what they are doing and why to anyone who asks.

  2. Pass out clipboards and the maps the youth prepared in the classroom.

  3. Assign the youth structures and other features to measure in the garden, such as the border, buildings, water sources, etc. The youth should measure the size of larger structures (e.g., buildings) and the location of all features so that they can place them on their maps.

  4. Youth should divide into their teams of three members and proceed to find their assigned features to measure.

  5. Remind youth to note on their map any key components of the that can not be captured on a photo or a sketch garden (e.g., a hot area, a windy area, an open area, a change in slope).

• After the Activity:
  1. Have the youth share their maps, measurements, and observations. They should add the features that other groups measured to their map, so each group has a map with all the features. Or they can make one composite base map with all the features.

  4. Taking Photos
  Time Needed
  • Preparing the youth: 15 minutes
  • Activity in garden: 90 minutes

  Materials
  For each youth group:
  • Disposable or Polaroid camera (minimum 15 exposures)
  • Copy of Photo Activity Checklist

  Procedure
  • Preparing Youth:
    1. Group the youth into teams of two.
    2. Provide a camera for each team with their names taped or written on it in a font that is fun for the youth.
    3. Have the youth tape the Photo Activity Checklist to their camera.

  • Conducting the Activity:
    1. Instruct the youth to check off each feature as they photograph it. The order of photos doesn’t matter. Tell them not to worry if they don’t think they got a good picture of any particular feature. For each feature, they should go to the place that comes to their mind—not what they think other people would think of, or what they think you want them to answer.

    2. The youth may want to include each other in the photos. They can stand next to the feature from the checklist and point to it.
• After the Activity:
  1. If you used disposable cameras, label each film envelope with the team’s name and send them off to be developed. (If possible, get double prints and give the youth copies of photos.)

5. Photo Collage

Time Needed
• Before meeting with youth: 30 minutes
• Activity: 1.5 hours

Materials
For each youth team:
• Newsprint
• Photos from the garden
• Pencils
• Markers
• Masking tape
• 3” x 3” post-its

Procedure
• Before Meeting with Youth:
  1. For each youth team, divide a 24” x 36” sheet of newsprint into 15 sections and label each section with an item from the Photo Activity Checklist. Label each sheet with the team members’ names and tape them on the wall, leaving room for youth to move around and observe the charts.

• Conducting the Activity
  1. Explain to the youth that the purpose of the photo workshop is to share their impressions about the garden and to learn what the other youth thought about the garden.

2. Distribute to each team the envelopes with their developed photos. Then have the youth discuss with their partner where each photo should go on the newsprint, based on how they had earlier interpreted it in the garden.

3. Using masking tape, have the youth tape their photos in the appropriate box on their newsprint, one photo per section. Have the youth write a short comment on the newsprint about why they believe that photo should be under that category.

4. Have the youth look at the photos taken by other youth. Using the post-its, have them write a short a comment on five key pictures that stood out for them from the other groups, and post them on the appropriate newsprint.

5. Guide the youth in a discussion of what they saw and experienced during the activity. Make notes on a separate sheet of newsprint about consistent observations from the garden (e.g., the garden as a social place or a lonely place).

6. Tell the youth that making observations is part of how landscape designers analyze a site. Designers take photos of key components of the garden that catch their attention and use those pictures when they are working in their studio to remind them of how they saw and felt about the garden.

6. Sketching

Time Needed
• Before meeting with youth: 15 minutes
• Preparation with youth: 20 minutes
• Activity in garden: 2 hours
• Discussion: 45 minutes

Materials
For each youth:
• Sketching paper (8.5” x 11” newsprint or acid-free sketch paper drawing pads are ideal)
• Sketching/drawing pencils (2B, 4B, 6B, 8B highly recommended, available at art supply stores)
• Clipboards
• Paper for notes
• Pencils

Procedure
• Before Meeting with Youth:
  1. Decide which concepts the youth need to go over from the Sketching Concepts Handout. If the youth are familiar with drawing/sketching techniques they can help out others who are new to drawing.
Preparing the Youth:
1. Suggest a few quick exercises to help the youth learn about shadowing, texturizing, and letting loose their hand when sketching.

2. Discuss the different ways a designer can record information in the field, both visual and using words (e.g., photos, maps, sketching, and note taking). Explain that when they sketch, the youth should quickly jot down notes to capture the essence of the object being observed without getting into too much detail.

3. The sketching should focus primarily on plants, especially plants the youth are unfamiliar with, and on structures found in the garden (e.g., tool shed, shade structure, casita, bench). Explain to the youth that by sketching, they will add to the visual understanding of the garden they gained through taking photos.

Conducting the Activity:
1. In groups of two-three, have the youth find a quiet spot that is not disruptive of any gardener and sketch a particular plant or structure in the garden.

2. Walk around and provide feedback to the youth on their sketches.

3. Have the youth show the drawings to the gardeners and ask them the names of the plants in English and in the gardeners' native languages. Have the gardeners also explain culinary and medicinal uses and cultural significance of the plants.

4. Have the youth take notes on what they learn from the gardeners.

Garden Plan
In this series of activities youth create a plan for the garden based on what they learned through talking with the gardeners, measuring the garden, and photographing and sketching plants and other features in the garden. There are three parts to creating the plan, including the design charette, draft plan, and final master plan.

7. Design Charette

Time Needed
• Before meeting with youth: 30 minutes
• Activity: 90 minutes

Materials
For each youth team:
• Newsprint
• Base map of garden (24" x 36" recommended)
• Markers (different colors)
• Scissors
• Glue or tape
• Construction paper: green for different circular forms for trees, shrubs; brown for paths, planting boxes, structures; and blue for water features (ponds, fountain).

Procedure
• Before Meeting with Youth:
1. Prepare copies of the base map the youth made in Measuring the Site on 24" x 36" newsprint. Include existing objects that are relevant to designing a new garden on the site, and that cannot be removed (e.g., trees, plant beds, water sources). The youth will use the base map to make their initial site plan.

Conducting the Activity
1. Explain that the purpose of the design charette is to brainstorm ideas for the garden plan. Drawing from the ideas they brainstorm, the youth will come to a consensus on what is important for the garden plan.

2. If you are working in an existing garden, guide the youth in a discussion of what part of the garden they might help by developing a new design. Have them consider what needs to stay as is and what the gardeners have expressed an interest in or concern about. Provide some examples of the photos the youth took at the garden to highlight important elements, both positive and
negative, in the garden. Issues they might discuss include:
• unique cultural practices
• plant needs (e.g., water)
• needs of the gardeners, their children, and other visitors to the garden
• areas with poor soil
• non-cultivated areas of the garden
• areas that get lots of sunlight and areas that are shaded by buildings.

3. If you are working in a site that is not presently a garden, guide the youth in a discussion of what they might like to include in their garden. They should consider what needs to stay the same and what might be changed at the site, what gardeners find important, and the interests of potential users of the new garden (e.g., students and teachers for a school garden).

4. Create a poster of brief bullets that capture the essentials of what youth discuss and what you remember from previous discussions and observations.

5. Help the youth decide what aspect of the garden they will create a design for.

6. Divide the group into teams of four-five members. Provide each team with a manila envelope with construction paper, scissors, glue/tape, and markers. Have the teams label their envelope with the names of the members.

7. Have the teams brainstorm designs that might help the garden and the gardeners. In addition to drawing from what they learned in the garden, they can think back to ideas from previous exposure to different landscapes (e.g., schoolyards, parks, other gardens).

8. To create an initial site plan, have the youth mark-up their copy of the base map with their ideas and place the construction paper shapes on the map with text explaining the shapes. Their site plan should begin to come to life!

9. Have the youth glue or tape down the construction paper shapes on this initial site plan and label it with their names.

10. Allow youth to walk around to view each other’s site plans and to jot down notes about their observations.

11. Hold a discussion of the various design ideas.

8. Draft Plan

**Time required**
• Before meeting with youth: 30 minutes
• Activity: 4 hrs

**Materials**
For each youth:
• Engineering ruler (available in art store) or regular ruler
• Mechanical pencils (available in art store, provide a consistent line and are easily erased)
• T-square and triangle to enable youth to create angles and squares (available in art store)
• White erasers (erase without smudging, available through art store)
• Base map or 8" x 11" paper
• Transparency paper (e.g., tracing or other flimsy paper, 18" x 24" recommended, available through art store)
• Masking tape
• Newsprint (18" x 24" or 24" x 36")

**Procedure**
• Before Meeting with Youth:
  1. Because it may be expensive to buy engineering rulers for each student, you may want to obtain one ruler and copy the scale (side of the ruler) the youth will use for the site plan. Then the youth can cut out the copied scale and tape it on top of an inexpensive ruler.

  2. Prepare copies of the base map the youth made in Measuring the Site on 24" x 36" newsprint. Include existing objects that are relevant to designing a new garden on the site, and that cannot be removed (e.g., trees, plant beds, water sources). The youth will use the base map to make their initial site plan.
Conducting the Activity

1. Help the youth become acquainted with the engineer scale. Each edge of the ruler has a scale showing feet per inch. This amount is usually a multiple of ten (e.g., 20’ per 1”, 30’ per 1”, etc.). So, using a 60 scale, 60 feet on the site would measure 1 inch on the site plan. If you are developing a plan for a smaller site, you can divide by 10 so that 6 feet on the ground = 1 inch.

2. If a base map drawn to scale is already available, help the youth become acquainted with the scale provided. Make them aware of actual measurements in the garden, such as the dimensions of walkways, planting beds, and benches. Have them sketch these items using the scale chosen. If they are unfamiliar with scale, you may want to have them measure structures, sidewalks, etc. and then draw them to scale.

3. If a base map drawn to scale is not available, determine the perimeter of the garden, based on the measurements taken during Measuring the Site. Once the dimensions are sketched out on a regular 8.5” x 11” paper, help the youth choose a scale that captures the same dimensions to scale on a 18” x 24” or 24” x 36” sheet of paper. Use a T-square and triangle to achieve perfect 90 degree corners.

4. Tape a piece of tracing paper or other transparency, slightly smaller than the base map, onto the base map. Tape the base map to the table with masking tape.

5. Explain to the youth about line hierarchy. When drafting structures or walkways, the width of the line should reflect the thickness and importance of the structure. For example, a building will have the heaviest line since it is a solid and thick structure. A bench should be thinner than the building but thicker than a line for a walkway. To make thicker lines, press on the hand that holds the pencil.

6. Explain to the youth about shadows, which should vary from light to medium to dark, depending on the size or thickness of the structure and the way light falls on the plants and other objects.

7. Distribute the pencils, erasers, and paper necessary to begin tracing the site plan onto the transparency. Instruct the youth to create the site plan from the initial plan they made in the design charette.

8. Youth should roughly, and very lightly, lay out on the site plan transparency the major components from their design charette. This may include new pathways, beds, gathering areas, and other features.

9. Next youth should draw the structures and pathways to scale using their scale ruler, never forgetting to keep track of what scale they are using.

10. Instruct the youth to cover the part of the plan they are not working on with paper to prevent smudging.

11. Instruct the youth to distinguish between different types of plants by using different textures (see Sketching).

12. Throughout the activity, remind the youth about line hierarchy and the use of shadows.

13. Ask youth to clean up and erase any smudges and messy lines on their site plan.

14. Youth should make a neat and accurate border around their plan by using their triangles and t-square making a perfect 90 degree square.

15. Instruct the youth to leave enough room at the bottom of their site plan to put the title of the project (in the middle), the name of the youth organization and date (in the left bottom corner), and the scale that was used along with an arrow showing
North (bottom right corner). Youth can either type or neatly print out the text, making sure they keep their writing consistent.

16. Youth should label objects and structures in the garden, small enough as to not distract from the line hierarchy of the plan, but consistent with the importance of the object or structure.

17. The text for the site plan title should be the boldest, the name and scale should be less bold, and the text inside the plan should be smaller and not distract from the lines. Text should always face the same way.

18. Collect the site plans taped over the base maps and have them copied onto bond paper, which is more professional and lasts longer than newsprint. Youth can keep the original black and white drafts.

9. **Master Plan**

In this activity, the youth will complete their site plans, including a master plan, sketches, maps, and written notes. They will then be ready to present their plans to the gardeners and other interested people.

**Time Required**
- Before meeting with youth: 30 minutes
- Conducting the Activity: 2-4 hours

**Materials**
*For each youth:*
- Their own draft site plan, copied onto bond paper
- Coloring media (green colors are popular for gardens): soft pastel (soft visual effect), oil pastel (bold visual effect), colored pencils (detailed visual effect), watercolors (romantic visual effect)
- Fixative or hair spray if using soft pastels
- Foam board the size of the plan (may need cutting blade to cut foam board)
- Adhesive spray

**Procedure**
- **Before Meeting with Youth:**
  1. Using a sharp, strong cutting blade, prepare foam board the same size as site plans.

- **Conducting the Activity**
  1. Remind youth that the purpose of the master plan is to present a visual image of the garden to the gardeners and other interested people.

  2. Introduce youth to the different media and allow them to experiment and choose the media that best suit them. If available, show the youth plans using different media.

  3. Go over drawing concepts, including:
     - **Shadowing**
       Which side sun is coming from; south side gets the most light; north gets darker colors due to shadowing; distinction between light, medium, and dark colors; transition from very light colors to very dark/shadowy colors.
     - **Color scheme**
       No more than 4-6 colors should be used on a plan; more colors make the drawing “muddy;” mix and match colors to create new colors.
     - **Mix-match media**
       Use color pencils to highlight detail on pastel work; use pencil to highlight detail in any medium.
     - **Neatness**
       Keep the site plan clean at all times by putting scratch paper on top of area that is not being drawn.
     - **Boldness**
       Use bold colors to highlight important parts of plan through pressure on the pencil, color pastel, and using more detail and shadows.

  4. Distribute the youth’s site plans copied onto bond paper and have them complete the master plan using the various media. Provide enough scratch-paper to cover portions of the site plan they are not working on and to test the media as they go along.

  5. Ask youth to erase any accidental smudges.
6. For youth who used soft pastel, have them spray fixative on the plan to prevent fading and smudges. Hair spray also works but is heavier and smellier.

7. Pass out the foam boards and help youth glue their master plan down with the adhesive spray, following instructions on the can. Spray the adhesive onto the board first and then beginning at one side, slowly and carefully attach the master plan, making sure that no air bubbles appear.

8. Set up an appointment to meet with the gardeners and other interested individuals for a final presentation of the design project.

Photo Activity Checklist

**Small font for taping on camera**
1. A place to rest
2. A place where you would like to hang out
3. A place to talk with others
4. A lonely place
5. A place to play games (for example, cards, horseshoes)
6. An exciting place
7. A place where you would like to walk
8. A beautiful place
9. An ugly place
10. A boring place
11. An unsafe or stressful place
12. A safe, peaceful place

**Larger font for cutting out and putting on newsprint**
1. A place to rest
2. A place where you would like to hang out
3. A place to talk with others
4. A place to play games (for example, cards, horseshoes)
5. A lonely place
6. An exciting place
7. A place where you would like to walk
8. A beautiful place
9. An ugly place
10. A boring place
11. An unsafe or stressful place
12. A safe, peaceful place


Sketching Concepts Handout

If lines give structure and content to a drawing, then it is light, shade and shadow that make a drawing come alive. DaVinci advised: “You who draw from nature, look carefully at the extent, the degree and the form of the lights and shadows.” Tone and shadow breathe life into a landscape drawing while giving it depth and atmosphere. Landscape drawings are usually a combination of line and tone (Sullivan, 1997).

**Tone**

Tone refers to light and dark in a drawing. You can integrate light and dark to create a range of tones. To produce tone with a pencil or charcoal, place the strokes close together to create subtle, smooth, even gradations. With pen and ink, you apply light parallel and cross-hatched lines.

**Hatching**

Hatching refers to short parallel lines repeated in patterns. You can make tones appear light or dark by changing the variety and spacing (tight or loose) of the hatching. For added character, you can curve the hatch lines slightly or place them at different angles.

**Cross-Hatching**

Cross-hatching is a variation of hatching, but can produce a wider range of tones. To create cross-hatching, draw a series of short parallel lines. Then draw a series of lines on top of and at right angles to your first set of lines. Keep repeating this process by overlapping the hatched lines at a slightly different angle each time until you produce almost total blackness.

**Light**

Before beginning a drawing always note where the light is coming from.
Exploiting the light will illuminate your landscape drawing and make it appear three-dimensional. Work out the composition of your drawing using light lines, starting with the light areas and then adding the shade. The source and the quality of the light will affect your gray tones.

**Shadow**
The area of an object opposite the light source is shaded. The cast shadow generally appears darker than the shaded side of the object, and the shadow is darkest along its leading edge. The shadow also will reflect the form of the object that is casting the shadow.

**Texture**
The landscape contains an endless variety of textures. You may want to look at some famous paintings, such as those by Vincent Van Gogh, to get an idea of how a landscape artist can create an amazing array of textures. Every element in the landscape has texture, and you should reflect these unique textures in the drawing to give each element a separate identity. At the same time, develop a textural style that unifies the picture and avoids “chaos” in the drawing. Shadows reflect the various textures of the landscape upon which they are cast. Texture is more than just pattern—it is lively, interwoven lines that remind the viewer of the sense of touch and stimulate the imagination.

Garden Enhancement Action Projects

In the Garden Enhancement Action Project, youth make improvements or build something for the garden. For example, youth can construct raised beds or a compost system. Or they might want to help gardeners repair or paint a fence. The youth should ask the gardeners questions about what is needed in the garden during the *i-m-science investigations*. They should then use this information to decide what to build or improve as part of their Action Project. Although the examples here come from community gardens, you should be able to adapt them for home or school garden or other youth programs.

Ideas for Garden Enhancement Action Projects

- Build a compost system
- Construct a bench
- Arrange for mulch to be donated and delivered to the garden
- Paint a picnic table or a fence
- Build a water collection system
- Paint a mural along a fence
- Create and put up interpretive signs
- Organize and participate in a day where youth help gardeners weed their plots
- Build a raised bed
- Plant flowers
- Grade 5-6 Lesson 8 April
Example Projects
Following are example Garden Enhancement Action Projects. Our intent here is to give you a range of possibilities, which we hope will prove useful as you help the youth develop their own project.

Raised Beds
During the im-science investigations, the youth learn that the garden needs a wheelchair accessible raised bed. (Such a bed would need to be higher than the beds currently in the garden.) The youth ask the garden manager if they could meet with other gardeners and talk about ideas for the new bed. To prepare for their meeting, the youth read the Raised Beds Science Page and talk with an occupational therapist to learn about needs of people in wheel chairs. They also spend time observing in the garden to see what location might be best for the new bed. They make several phone calls to local hardware stores to figure out the cost of supplies. They then develop a design for the bed and present it to the gardeners and explain the different materials that could be used and their costs. They ask the gardeners to help them select which materials and location would be best. The youth obtain the materials and supplies and organize a work day to construct the bed. The gardeners get soil delivered from the city parks department to fill the bed.

Compost System
During the im-science investigations, the youth observe that gardeners are throwing weeds and clippings into the trash. They also note that the soils are gray and appear to lack organic matter. They discuss with the gardeners the possibility of building a compost bin to recycle the weeds and clippings. They use the Composting Science Page to learn about the science behind composting, and the Internet to learn how to construct a compost pile. Then they contact a local “Master Composter” from Cooperative Extension to speak with their group and the gardeners about different types of compost systems. They work with the gardeners to build a compost system from scrap lumber. Finally, they create a poster for the gardeners about how to maintain the composting system.

Mulch
During the im-science investigations, the youth observe that one gardener is mulching his plots, and that his plants seem to be healthier during hot, dry weather. The youth talk with the other gardeners and learn that they also would like to mulch their plots, but have not been able to find a source of mulch. The youth become familiar with different kinds of mulching through reading the Mulch Science Page. Next they contact a local greening organization that works with community gardens and ask them to help locate a source of mulch. It turns out that mulch is available through the Parks Department and the greening organization will deliver it. The youth organize a garden workday with other youth from the neighborhood. They help the gardeners to haul and spread the mulch in their plots.
**Watering System**

During the *im·science investigations*, the youth observe that the gardeners do not have access to the city water supply and obtain water from barrels located throughout the garden. The barrels get filled by rainwater, and so are empty during dry spells. They talk with an urban gardening expert to learn more about different types of systems used by gardeners to collect water. They notice that the casita in the garden has a sizable metal roof and might be perfect for collecting rain water. They discuss their ideas with the gardeners and present several options for constructing a rainwater collection system. Finally they help the gardeners obtain the materials and organize a workday to build the collection system.

**Interpretive Signs**

During the *im·science investigations*, the youth note that children’s groups often visit the garden. They also observe that, due to their limited ability to speak English, the gardeners have a difficult time talking to the youth about their plants and planting practices. The youth ask the gardeners if they might work together to create interpretive signs for children visiting the garden. They talk with the gardeners about what would be the most important things they want the children to learn. They then use the appropriate Science Pages to learn more about the garden plants and practices, and laminate appropriate color Science Pages for posting in the garden. They also develop some of their own signs for the garden.

**Plant Flowers**

During the *im·science investigations*, the youth observe that on both sides of the entrance to the garden, there is a section of bare dirt that is at times dusty or muddy. They notice another garden during their Neighborhood Exploration that has a beautiful flower bed planted along the fence. They talk with the gardeners about putting in a flower bed on both sides of the entrance. The gardeners are interested and take a walk with the youth to observe the flower bed at the other garden. The youth obtain seeds through a local greening organization and then plant the flower bed with the gardeners.

**Create a Mural**

During the Community Garden Inventory, the youth observe that the fence on the side of the garden is covered with flaking paint and old graffiti. They talk with the gardeners about creating a mural and secure permission from the property owner to paint on the fence. The youth next search the Garden Mosaics website for photos of other community gardens with murals. They also look at Science Pages that are of interest to them to get ideas for garden science concepts that might be displayed on a mural. They then contact a local artist and art teacher to help them work with the gardeners to sketch out a plan for the mural. Finally, they hold a mural day during which the youth and gardeners paint the pictures on the fence.
Garden Research Action Projects

In the Garden Research Action Project, youth conduct research to answer a question that the gardeners or youth raise during the *im-science investigations*. You can help the youth decide which questions and methods are best, given the gardeners’ interests, and time and other constraints of your program. The focus of the Garden Research Action Projects can be on plants, soils, water, light, or insects or other animals in the garden. Although the examples come from community gardens, you should be able to adapt them for home or school garden or other youth programs.

Youth can conduct observations, take measurements, or learn from other scientists to answer any number of questions. Alternatively, they may want to conduct a longer-term research project involving an experiment. Experimental research usually incorporates the three other types of research.

Types of Garden Research Action Projects

- **Learn From Other Scientists**
  Contact a local expert or conduct an Internet or library search.

- **Measurements**
  Take measurements of soils or plants.

- **Observations**
  Make observations of plant growth in relation to the environment and formulate preliminary hypotheses that could be tested by an experiment.

- **Experiments**
  Conduct a controlled experiment to test the effect of one factor on plant growth.

Often an experiment begins with observations in a garden. For example, youth may observe that collard plants growing in the shade seem to have fewer leaves than collards growing in the sun. This may lead to a question that the youth want to investigate further: What is the effect of sunlight on growth of collards? The youth may form a hypothesis: Collards growing in the sun are more productive than collards growing in the shade. The first step in testing their hypothesis would be to conduct background research, or learn from what other scientists have already discovered. This can be done either by talking with scientists or reading about their work, often on university or government agency websites. Based on what they learn from other scientists, the youth may want to refine their question and hypothesis. They likely also will learn about methods for testing their hypothesis. Conducting the experiment can involve taking measurements and making additional observations.
If they are conducting research on a practice the gardeners are using, the youth need to be aware of issues related to gardener knowledge and scientific knowledge. Gardeners generally use practices that they feel give desired results, but there may not be any scientific research to back their claims. For example, many gardeners use companion planting to reduce pests, but there is little research that shows this is effective. The youth need to be aware that experiments conducted under controlled conditions are one form of knowledge, but that the knowledge of gardeners based on many years of experience is also important. You will need to work with the youth so they present their research results but also are respectful of the gardeners' knowledge. The youth should also be open to further research where their results may conflict with what the gardeners believe is true from experience.

**Example Projects**

Following are examples of each of the types of Garden Research Action Projects. Our intent here is to give you a range of possibilities, using different research methods and resulting in different actions. We hope these examples prove useful as you help youth develop their own project.
Learning from other Scientists
Youth can use the Internet or library to research a question that comes up during the i-m-science investigations. They should be aware of the source of information on the Internet. If a website is developed by university or government scientists, you can generally count on the scientific information being accurate. Commercial and other websites sometimes promote a product or point of view rather than present unbiased information.

Example Learning from other Scientists Project: Insecticide Safety
During the i-m-science investigations, the gardeners express concern about the safety of an insecticide they are using. The youth decide to research the question: “What are the safety risks of this insecticide?” They decide to use the Internet and local experts to answer their research question. They search for sites describing the pesticide and its risks, and compile information from university and government websites. They next ask an entomologist to come to the garden to discuss insecticide uses and risks. They present their results in a poster for the gardeners. They also laminate the poster and post it along the fence in the garden for others to read, and report their results to the Garden Mosaics website using the online Action Project Form.

Ideas for “Learning from other Scientists” Action Projects

- What are the health risks of a pesticide used by the gardeners?
- How do farmers and gardeners in other cities grow taro?
- What lead levels in soil are dangerous to children?
- Does using treated lumber in raised beds contaminate the soil?
- Are marigolds effective in protecting plants from soil insects?
- What varieties of collards are resistant to whiteflies?
- How do the “beneficial” insects attracted to cilantro benefit other plants?
- What varieties of trees grow well in urban gardens?
Measurements

Some questions can be answered by taking measurements on soil or plant samples. Whenever youth take measurements, they need to decide where and when to sample. This is because the plants and soils may vary depending on where they are in the garden. The research question should guide decisions about where and when to sample. For example, if the gardeners want to know whether lead is a problem in soils, the youth would need to ask if they are concerned about soils only in the plots with vegetables or also where flowers and other ornamentals are grown.

In some cases, the youth may collect samples and send them to a lab for testing. For example, youth could measure plant height or soil pH, but they will need to send plant or soil samples to the lab to be tested for lead or other contaminants. Check university and other website guidelines for collecting and sending in samples, and for costs associated with different analyses.

Example Measurements Project: Soil Percolation

During the i-m-science investigations, the youth observe that the soils look very hard and that water seems to collect on top of the soils. They decide on their research question: “How fast does water move in soils in each plot in the garden and in the paths between the plots?” They next read the Water in the Garden and Watering Garden Plants Science Pages to gain background understanding for their research. They discuss their question with the gardeners to get their input and to explain what they will do. They use the “Soil Perc” test to measure the soils in each plot and along the paths (see Try This, Water in the Garden Science Page). They discover that water percolates very slowly in some plots, so they contact their Cooperative Extension agent to learn how to reduce soil compaction. The youth and gardeners conduct a workshop for other gardeners to share the results, demonstrate the Soil Perc test, and discuss ways to enhance water movement in soils. They also send photos of their project and report their results to the Garden Mosaics website using the online Action Project Form.

Ideas for “Measurements” Action Projects

- How fast does water move through the soil?
- What is the lead level of the soil?
- How much rain did we get each week during the summer?
- How tall do the sunflower plants grow?
- How many hours a day are the garden plots in the sun?
- How many tomatoes are produced on one plant?
- What is the soil pH?
- What is the texture of the soil?
- What is the maximum and minimum temperature each day?
- How many days does it take mustard greens to mature?
Observations
Youth can conduct observations in the garden and compile them into reports that are useful to the gardeners.

Example Observations Project: Plant List
The youth realize that the Hmong gardeners use names for insects in their own language but aren’t always familiar with the English names. The youth decide to answer the question: “What are the English and Hmong names of all the plants in the garden?” Working with the gardeners and a horticulturalist from a nearby university, the youth observe and compile a list of the plants growing in each plot. They also take photos of each plant they observe. Throughout the observations, they refer to the Science Pages to learn more about the plants. They then develop a table of the English and Hmong names of each plant. They create a poster with the names and a photograph of each plant and present it to the gardeners. They also add their plant list to the Community Garden Inventory Form that they submitted to the Garden Mosaics website. Finally, they report their results, including photos, to the Garden Mosaics website using the online Action Project Form.

Ideas for “Observations” Action Projects

- What insects feed on leaves of plants in the garden?
- What insects pollinate flowers in the garden?
- What plants are wilted on hot, dry days?
- What vegetables are commonly found in the garden?
- What medicinal herbs are found in the garden?
- What plant diseases are found in the garden?
- What different methods do gardeners use to control weeds?
- What weeds are present in the garden?
- What plants do birds visit in the garden?
Experiments
Experiments usually involve all three research methods we have discussed so far: learning from other scientists, taking measurements, and making observations. Youth conducting experiments define a hypothesis in addition to defining a research question. The hypothesis makes a prediction about what the results will show. For example, youth in Chicago may hypothesize that a variety of a plant developed for northern climates will grow better than a variety developed for the south.

When conducting an experiment, the youth should vary only one factor at a time. For example, if they test two varieties of a plant, the only factor they should vary is the plant variety. (The plant variety is called the “treatment.”) Everything else, including soils, watering, and light, should be kept the same for both varieties. If two or more factors are varied at the same time (e.g., amount of fertilizer and plant variety), then it will be very difficult to say which factor caused any differences in plant growth.

Ideas for “Experiments” Action Projects

- What is the effect of mulch on growth of weekds?
- Does corn grow more rapidly when planted with beans?
- Does planting marigolds around the edge of a raised bed reduce insect damage to kale?
- Is hot pepper solution effective in controlling insects?
- What variety of chili peppers produces the most chiles?
- Does weeding result in larger eggplants?
- Does applying manure result in larger bitter melons?
- What is the effect of adding compost to soil on soil drainage?

It is much easier to control all factors except for the “treatment” in a greenhouse than in a garden. For example, when comparing plant growth in two different plots in a garden, it may be impossible to find plots that receive exactly the same amount of sunlight. Youth will need to find plots as similar as possible, and consider the possible effect of any factors they can’t control when interpreting their results.
Example Experiments Project: Use of Homemade Sprays to Deter Insects

During the i-m-science investigations, youth learn that gardeners use a homemade soap spray to deter insects on amaranth. The youth define their research question: “Is the soap spray effective in controlling insects on amaranth?” They use the Controlling Insects and Conducting an Experiment Science Pages to gather background information. They then ask the gardener if they can conduct a controlled experiment in the garden. They decide what measurements they will take (e.g., number of insects observed during 15 minutes in the morning and afternoon five days/week over a two-week period, number of leaves with insect damage). They create a data form for taking the measurements. They also choose two plots with amaranth, making sure that other factors (soil, sunlight, water) are the same for both plots. The youth next apply soap solution to amaranth in one plot and leave the amaranth in the other plot alone. They record the number of insects they observe and the amount of damage done to the leaves in both plots. To analyze their results, the youth average the measurements for each plot. They then summarize the results by making bar graphs of the average number of insects and average number of leaves with insect damage for each treatment (plants sprayed and not sprayed). In presenting the results to the gardeners, the youth are sensitive to the fact that if their results do not show an effect of the soap solution, this does not necessarily mean the gardeners are wrong in all cases. The educator leads the youth in a discussion of what other factors might affect their results (e.g., unusually dry or wet weather), and of the importance of years of experience versus an experiment. The educator asks the youth how they might conduct further research to determine the effectiveness of the spray. They report their results, including photos, to the Garden Mosaics website using the online Action Project Form.
Land Use Action Projects

In the Land Use Action Project, youth learn about the relationship of people to land in their neighborhood. For example, the youth may meet with a city planner, survey vacant lots, or create a Green Map™ of the neighborhood. Or they might learn about threats to green spaces and gardens and conduct a campaign to support community gardens. The youth’s interactions with the gardeners and their observations of the neighborhood during the i-m-science investigations will help them define their Land Use Action Project. Although the examples here come from community gardens, you should be able to adapt them for home or school garden or other youth programs.

Ideas for Land Use Action Projects

- Create a Green Map of your neighborhood
- Inventory multiple gardens and submit the data to the Community Garden Inventory
- Make a presentation to government officials about the importance of community gardens to neighborhoods
- Write a letter to local politicians about the need to preserve and create new community gardens
- Organize a garden celebration and invite local politicians
Example Projects
Following are example Land Use Action Projects. Our intent here is to give you a range of possibilities, which we hope will prove useful as you help the youth develop their own project.

**Inventory Multiple Gardens**
The youth have conducted the Community Garden Inventory *im-science investigation* and submitted their data online. They are aware that many community gardens in the neighborhood have not been added to the inventory. They decide to conduct the Community Garden Inventory and submit the data for all the gardens in the neighborhood. They work with Garden Mosaics to also post the data on the website for their youth organization.

**Create a Green Map™**
During the Neighborhood Exploration, youth observe the variety of ways that people use space in the neighborhood. They think it would be interesting to create a map of the neighborhood that would be a guide for residents and visitors, as well as a tool for influencing policy makers. They use the Aerial Photographs and Topographic Maps Science Pages to learn more about land use. They visit the Green Map™ website ([www.greenmap.org](http://www.greenmap.org)) and learn about how other youth have mapped their community. After discussion and reviewing a street map, they establish the boundaries of their map. They next break into teams to look for the different types of places identified on Green Maps™, including farmers’ markets, parks, public and community gardens, recreation areas, and pollution sources. When their map is complete, they make copies and distribute them to the gardeners, community members, and local officials.

**Garden History**
Youth learn from the garden manager that the garden is on the site of a former parking lot. The youth are amazed that what was once a barren landscape is now a thriving vegetable and flower garden. They realize however, that because of polluted soils, the gardeners must grow their plants in raised beds with soil that is delivered to the site. This story inspires them to further investigate the history of the land on which the garden now grows. Through contacting the local historical society and the city records office, and through conversations with elderly gardeners and neighborhood residents, the youth are able to create a timeline of the garden site history. They incorporate various photographs and airphotos from different time periods into the timeline. They present and discuss their findings with the gardeners and interested community members.

**Garden Open House**
Several of the youth live near the garden. Before participating in Garden Mosaics, they didn’t realize that there was a place like this in their community. They suggest to the gardeners hosting a garden open house or neighborhood block party as a way to introduce the garden to more neighborhood residents. The gardeners agree that this would be a nice way to tell community members that they are welcome to visit the garden and share its beauty. Also, the gardeners feel that vandalism would decrease if more neighborhood residents were aware of the garden and helping to keep an eye on it. The youth and gardeners discuss plans for the event with several neighborhood leaders and the youth offer to help advertise and organize the event. They invite friends and family to the garden block party and share what they’ve learned about the garden with the broader community.
**Meet with a City Planner**

On their walk around the neighborhood, the youth become aware of the lack of green spaces, such as parks, gardens, and tree-lined walkways. They discuss questions with their group leaders: What are other sections of the city like? Who decides where parks are located? Who decides where trees are planted? The group leader suggests that they talk with a city planner to learn more about green space in their city and about why the city ends up looking the way it does. During their meeting with the planner the youth learn a lot about green spaces and the urban development process. They also learn that the planner is very interested in having meetings with residents from different parts of the city and learning more about community gardens. The planner visits the garden to meet with the gardeners and everyone learns from each other.

**Create a Plan for Vacant Lots**

Visiting the garden, and learning about the history of the community gardening movement, inspires the youth to think about how vacant lots could have other uses. They decide to survey the neighborhood’s vacant lots and come up with plans for how these lots might be used. They call a city planner who is very interested in hearing their plans and who will help them organize an event where they share their ideas with local officials. The planner explains how some lots are owned by the city and others by absentee landlords. He also tells the youth that the city has to pay several hundred dollars a year to maintain one vacant lot. Some of the city-owned lots might be available for lease by people interested in starting gardens. The planner shares with the youth the latest map showing the location of vacant lots. The youth next “ground truth” the map, adding any new vacant lots and indicating former vacant lots that now are community gardens or that have been developed. They present the updated map to the planner, and arrange for a meeting of the planner with gardeners, other neighborhood residents, and local officials to discuss the future of the lots.

**Support Community Gardens**

The group leader arranges for the youth to meet with a Cooperative Extension educator who works with community gardens. The educator takes the youth on a tour of gardens and the youth meet with several gardeners. During the tour, the youth learn about the problems gardeners face, such as lack of funding for supplies and the need for more garden plots. The youth are inspired by their tour and ask how they could support community gardens in the city. The educator makes suggestions about organizations that help with supplies and creating new gardens. The youth contact these organizations and arrange for a meeting between their staff and the gardeners to discuss the gardeners’ needs.
Nutrition and Health Action Projects

In the Nutrition and Health Action Project, youth carry out an activity to promote good nutrition and health related to the garden. For example, they could host a banquet, develop a recipe book, create interpretive signs, research a health issue, or host a health and nutrition educational event. They can use what they learn during the i-m-science investigations to help decide the specifics of their Action Project. Although the examples here come from community gardens, you should be able to adapt them for home or school garden or other youth programs.

Ideas for Nutrition and Health Action Projects

- Hold a banquet using dishes prepared with vegetables from the garden
- Host a barbecue in the garden for elders from the neighborhood
- Create a poster about diet and health and laminate it for display in the garden
- Use the Internet to find out more about the nutritional value of plants in the garden
- Invite a Cooperative Extension agent to the garden to speak about diet and disease
- Make a cookbook from gardeners’ recipes
- Present a workshop on the health benefits of vegetables for elders or children
Example Projects
Following are several example Nutrition and Health Action Projects. Our intent here is to give you a range of possibilities, which we hope will prove useful as you help the youth develop their own project.

**Garden Banquet**
Youth learn during their *i-m-science investigations* that the gardeners will be celebrating the fifth anniversary of the founding of the garden. They plan a banquet for the gardeners and their families, using produce from the garden. The youth and gardeners do the cooking for the banquet.

**Recipe Book**
Youth learn during the *i-m-science investigations* about the ways in which the gardeners use their plants in cooking. They work with the gardeners and a nutritionist from Cooperative Extension to create a cookbook. The cookbook includes not only the recipes but also their nutritional and health value. The youth sell copies of the cookbook to earn money for the garden.

**Interpretive Signs**
Youth create interpretive signs focusing on the plants they learn about from the gardeners. They use the plant Science Pages, the Internet, and interviews with the gardeners to learn about the nutritional and medicinal value of the plants.

**Educational Event**
The youth make observations of health issues facing the gardeners, children, and other members of the community. They also express their own health concerns (e.g., weight, diabetes). They talk to a community nutritionist to learn more about their concerns. They then organize a Health Day at the garden, where they invite local health and nutrition organizations to set up booths to educate community members.

**Research a Health Issue**
Youth use the Internet or library to research a question about cancer and diet that comes up during their *i-m-science investigations*. They use websites developed by university scientists to ensure that the scientific information is accurate. They synthesize what they learn into a poster or PowerPoint presentation for the gardeners.
Action Project Planning Form

1. What is your goal for the project? (What do you hope to accomplish or make?)

2. List the steps needed to reach your goal.

3. What background information do you need? Where will you find it?

4. What supplies do you need?

5. What will be each person’s role in your Action Project? (List each member of your group and what they will do.)

6. How will gardeners, scientists, and others be involved in your Action Project?

7. How will you present your project to the gardeners and other community members?
Lesson Nine: Let’s Celebrate Our Garden Harvest!
For May/June

“Harvest Celebration” from EATING FROM THE GARDEN, University of Missouri Extension. How do you know when a crop is ready to harvest? What are the consequences of harvesting too early or too late? Where should picked vegetables be stored to retain their freshness? Students will learn about harvesting vegetables from the garden. Did students start Action projects? They can finish them up and report on the projects after the garden is harvested.

Content objectives: Describe the importance of eating fruits and vegetables; Review where the fruits and vegetables are grown the plant and which season to plant them; Recognize when plants are ready for harvest.

Life Skill objectives: Healthy lifestyle choices, Critical thinking, Communication, Citizenship, Leadership, Decision making, Problem solving

Core and STEM concepts and skills:
Science: Science as inquiry, Earth and space, Life science
Math: Operations and algebraic thinking, Numbers, Measurement and data, Geometry, Mathematical practices
Language Arts: Reading for information, Vocabulary, Speaking, Listening, Viewing

Healthy snack: Select recipes from past lessons that contain the vegetables you harvest from the garden.

Additional and supporting resources: Cooperative Extension Master Gardener’s Program can be a resource for garden information.
LESSON PLANS FOR 2012-13 SCHOOL YEAR, GRADE 5-6

May/June: Let’s celebrate our garden harvest!

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Separate Files
BEFORE THE LESSON

1. Grade 5_6, May/June: Let’s Celebrate Our Garden Harvest! 2012-13 School Year
This document contains the lesson plans and resources for this lesson. There are two additional files, Jeopardy Set Up (pdf) and Jeopardy (powerpoint) for this lesson. All lesson downloads are located on the www.peoplesgarden.wsu.edu Educational Toolkit. Please read through everything well in advance of delivering this lesson.

2. Harvesting Resources
Food Safety Tips for School Gardens, excerpted from United States Department of Agriculture
Harvesting and Storing Vegetables, Iowa State University Extension and Outreach
Please read and use these resources as guides to tell you when and how to harvest the crops from your school garden. If the students and their families have a garden or would like to start a garden, you may copy these resources to send home with the students. Please continue with your gardening through the end of the school year. Work with your Extension Educator to finalize plans for the garden during the summer, and make plans for next year.

3. Garden Journal
Have students complete any items for their garden journal.

4. Recipe: Select a recipe based on the items available to harvest. Refer to recipes from precious lessons. Gather everything you need for the selected recipe.

THE LESSON
You may want to spread your Harvest Celebration over several days.
Overview:
1. Eating from the Harvest Jeopardy: This is an opportunity to review both nutrition and gardening concepts in a fun session.
2. Harvest vegetables from the garden.
3. Prepare the garden vegetables to sample in class.
4. Getting the garden ready for the summer. This can include putting the garden to bed if there will not be any summer gardening.
5. Optional: Harvest Party. Consider inviting guests to your Harvest Celebration. Have students brainstorm who to invite, and what to show them. If parents or other school administrators are attending, they can participate in the lesson by joining in the song, helping students prepare the salad, and tasting the recipe. Consider offering a garden tour.

AFTER THE LESSON
If the garden will not be tended over the summer, make plans to put the garden to bed before the end of the school year.
SCHOOL GARDEN HARVESTING GUIDE
Prepared by Liz Falk, Cornell Garden-based Learning

Harvesting is one of the nicest chores of the season. If you follow a few important, but easy tips, you will get the most of your crops. Some crops (e.g. carrots) only provide one harvest, while other crops (e.g. lettuce) can provide multiple harvests. If possible, harvest early in the morning, after the dew dries, but before the heat of the day.

**LEAFY GREENS – Lettuce & the Brassica Family** *(including Spinach, Kale, Chard, Collards, Asian Greens, Mustards)*

To harvest at peak flavor and freshness, harvest young greens when they are just a few inches long. At this stage all greens are tender and delicious eaten raw in a salad. These are called “baby greens”. Pick the largest, outside, leaves first while leaving the smaller and younger inside leaves for harvesting in a week or two. If possible, eat your greens the same day you pick them. Larger leaves, 6-12” long, are less tender and are best for cooking. Remember that greens cook down; plan about 6 cups of greens for 4 usual servings. Always wash garden greens carefully before eating or cooking to remove dirt and small insects.

*Tip*: Snip (with scissors or skilled fingers) the greens about ½-1” above the base of the plant to encourage new growth. Harvesting this way will allow you to get 3-5 cuttings of lettuce and spinach and even more from kale, chard and other hardier greens.

*Note on Lettuce*: If you planted head lettuce and prefer to harvest an entire head, wait until the entire lettuce plant is about softball - melon size and looks like the shape of head lettuce, as you know it. Don’t wait too long though - Growing head lettuce rather than harvesting baby greens often allows more time for pests and diseases to attack the crop.

**LEGUMES – Peas, Snow Peas, Beans**

Harvest peas with 2 hands, holding the vine with one hand while snipping the entire pod off the vine with your other hand. Harvest when fully mature, about 2” long for peas and 4” long for beans, depending on the variety planted. Harvesting encourages new growth, so be sure to pick off over-ripe pods you may have missed earlier on. Continue to harvest from the same vines as the legume ripens.

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**Simple Greens Recipe**
- Wash and dry greens and cut larger leaves into pieces about 3 inches long.
- Heat a bit of olive oil in pan with a clove of chopped garlic or a few tablespoons of chopped onion. Cook 2-3 minutes.
- Add greens and a dash of water. You may keep the greens plain or drizzle with a dash of soy sauce or balsamic vinegar.
- Cook 3-4 minutes until softened.
- Remove from heat, place into bowl. Sprinkle with slivered almonds, sunflowers seeds and dried cranberries, or chives chopped chives from your garden.
- Serve cold or warm.
Peas and young beans can be eaten raw, added to salads, or lightly steamed or sautéed.

**CUCUMBERS & SQUASH (CUCURBIT FAMILY)**

Harvest cucumbers as they ripen to the desired size. For pickling, fruits should be 4 to 5 inches long, for eating fresh; most varieties grow to 7-8 inches long. Cucumbers will develop a bitter taste if they are allowed to over-ripen. (Note: Some varieties such as European or Dutch cucumbers can grow much longer. This is another reason why clear labeling of the plants in the ground is useful.)

To ensure cucumber vines continue to produce heavily all season long, it’s best to harvest daily to prevent them from becoming overgrown.

Even though huge zucchini squash are impressive, they will be more flavorful if they are picked when they are smaller.

**Tip:** Use a sharp knife or pair of scissors when harvesting, and leave a short length of stem on each fruit.

**ROOTS – Carrot, Beets, Radish, Potato**

It can be difficult to determine if root crops are full grown and ready to harvest because they grow underneath the soil. You may recall, most seed packets will tell you how many “Days to Harvest.” This is the number of days it takes from planting to harvesting. If you can keep track of when you planted the seeds (maybe you wrote it down in the garden journal or it’s listed on the label that next to the plant in the ground), you’ll know about when they are ready. That said visual clues are always helpful. Roots start to lift themselves up out of the ground a bit as they develop. You’ll see radishes, beets and carrots creep a bit (< 1/4 inch) above the soil giving you a clue about how wide they are getting.

**Tip:** Radishes and beets are easy to pull out of the ground whole. Carrots often break off, leaving half of that sweet orange snack for the worms. To harvest them whole, use a digging fork to loosen the soil around the root and pull it out at the base of the greens. For radishes and beets, grab the plant right at the base of the stem, loosen the root a bit by rocking it back and forth, and then pull. If the whole thing does not come up, gently use a digging fork as you would for carrots.

For potatoes, you can start gently digging for new potatoes once the plants start to bloom. Wash and cook new potatoes immediately, as they do not store well at all. If you are planning to harvest potatoes to store for a while, wait until the tops of the plants start to yellow and die back. Then gently dig around the perimeter of the plant and dig up the tubers. If you are
planning on storing them, don't wash them! Let them sit out in a cool place for a few days to cure, then gently rub off any dirt, and store in a cool, dark place.

**FRUITS – Strawberries, Tomatoes, Peppers, Eggplant**

Similar to cucurbits, fruits like to be harvested when ripe and harvesting regularly encourages new production. Use a scissors or be very careful to snip eggplant and peppers from the stem without damaging the fruit. Leaving a small stem on the harvested fruit will help keep it ripe and ensure you don’t bruise it when harvested. Carefully pick tomatoes from the plant. For strawberries, grasp the stem just above the berry between the forefinger and the thumbnail and pull with a slight twisting motion. Carefully place the fruit into your containers.

**HERBS – Basil, parsley, mint, cilantro, oregano, rosemary, tarragon, sage, chives, lavender, thyme & more.**

Herbs are grown for their leaves, flower, roots or seed. Most commonly, culinary herbs are grown for their leaves and should be harvested before they flower. Flowering can cause the foliage to develop a bitter flavor. For example, while chives are quite attractive in bloom – and their flowers are edible and delicious – the stems tend to become tough and woody after bloom. Some general guidelines for harvesting herbs:

- Begin harvesting the herb when the plant has steadily been producing new growth. Harvesting generates the plant to continue to produce. Just be sure to leave enough leaves so the plant can continue to photosynthesize. Don’t be afraid to harvest. Up to 75% of the current season's growth can be harvested at one time!
- Harvest herbs before flowering, otherwise, leaf production declines because the plant will put its energy towards flowering and producing seed to reproduce. *Tip:* Pick off flowers buds as you notice them develop.
- ‘Annual’ herbs (basil, cilantro, chives) will have to be planted each year. They have soft stems and can be harvested until frost. Perennial herbs (rosemary, lavender) have somewhat woody stems and can be clipped until about one month before the frost date.
“Healthy Gardens, Healthy Youth”
People’s Garden School Pilot Project

The Extension Partnership including:
Washington State University Extension
Cornell University Cooperative Extension
Iowa State University Extension and Outreach
University of Arkansas Extension

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Growing and Harvesting Produce
A school garden provides an opportunity for children and volunteers to learn about how to handle food safely. The following are some food safety tips to follow when growing and harvesting produce.

- Ensure that all persons, including staff, students, and volunteers receive basic food and gardening safety training instructions according to local health regulations. The following topics are recommended:
  - Handwashing and personal hygiene
  - Cleaning and sanitizing garden equipment and containers used to hold produce
  - Handling produce during harvest, washing, and transportation
  - Glove use
- Ensure that volunteers are covered by the school district insurance policy in the event of accident or injury.
- Require signed permission slips for all student gardeners. Permission slips should list potential hazards of working in a school garden and identify any allergies the child may have.
- Do not allow anyone to work in the garden while sick, or until 24 hours after symptoms, such as vomiting or diarrhea, have subsided.
- Ensure that all harvesters wash hands thoroughly in warm, soapy water for at least 10 to 15 seconds, and then rinse with potable water. Ensure that all open cuts or wounds on hands, arms, or legs are properly covered prior to participating in the harvest.
- Require harvesters to wear closed-toed shoes to prevent cuts, stings, or other injuries.
- Consider using single-use disposable gloves when harvesting, or handling, fresh produce as an extra precaution.
- Harvest the garden regularly and remove any rotten produce.
• Use cleaned and sanitized food grade containers, such as plastic bins or buckets, to hold harvested produce. Do not use garbage bags, garbage cans, and any container that originally held chemicals. These types of containers are made from materials that are not intended for food use.
• Clean harvesting tools, such as knives, scissors, etc., with soap and potable water immediately before and after each gardening session.

Using School Garden Produce in your School Meal Program
• Check with your local health department to ensure that local regulations permit food from gardens to be served as part of school meals.
• If the harvest from the school garden will be used in the school meals program, the school garden coordinator should work cooperatively with the school nutrition director to plan and implement the garden.
• Discuss food safety practices in the garden with school garden coordinators. Consider asking gardeners to document their practices. Use the information in this document as a guide to identify appropriate practices.
• Accept produce harvested from school gardens only when school nutrition staff is present to receive it. All produce dropped off or left when staff is not present should not be used in the school meal programs.
• See Best Practices: Handling Fresh Produce in Schools for guidelines on receiving, storage, preparation, and service of fresh produce in schools.
• Reject produce that does not meet school nutrition program standards.
• Receive and inspect produce harvested from school gardens according to the same procedures used to inspect produce from the district’s distributors.
• Do not use any produce that has been noticeably contaminated by animals or insects.
• Refrigerate garden produce immediately, unless the particular item is normally held at room temperature.
• Store, prepare, and serve school garden produce separately from other sources of produce to maintain traceability.
• Document service of school garden produce on the menu management/food production record. See Ensuring Traceability of Fresh Produce for more information.
• Ensure that liability for a potential foodborne illness caused by produce grown in school gardens is covered by your school district.
How do you know when a crop is ready to harvest? What are the consequences of harvesting too early or too late? Where should picked vegetables be stored to retain their freshness? These questions and others will be answered in the lessons in this unit. Here are some guiding tips.

**WHEN AND HOW TO HARVEST**

There is a difference between “mature” and “ripe” garden produce that determines when to harvest them. A mature fruit or vegetable is one that has reached a sufficient stage of development that, after harvesting, is or will be at the best stage to eat. A vegetable or fruit is ripe when it is at its prime edible state. For example, pears, bananas, and sometimes tomatoes are harvested when they are mature, yet they may still be green in color. A few days after harvest, they “ripen” to the stage at which we like to eat them.

Beginning gardeners and children often pick vegetables, such as peppers, eggplant, carrots, cucumbers and potatoes, before they have reached the best stage for harvest. At a small stage, these crops are technically mature, but harvesting them too early results in low yields and less to eat. There are some exceptions and it depends on how you are going to use them. Early harvested, small potatoes – called “new potatoes” – are a tasty treat in early summer. Cucumbers are sometimes harvested early at a small size and used for pickles.

If you want a bell pepper for slicing or stuffing, it is best to wait to harvest it when it has reached its full size. A full-sized green tomato will ripen to red, orange, or yellow; and, if left on the plant, a full-sized green bell pepper will ripen into red, yellow, or even purple, depending on the variety.

Crops that are harvested and eaten at their peak ripeness are typically tastier and have a better texture than those eaten before they are ripe or when they are over ripe. As much as you don’t want to harvest crops too early, you don’t want to let them become over ripe in the garden. Crops that are left in the garden too long may become soft or even begin to rot. They are wasted and no longer edible.
Crops that continue to produce for several weeks in the summer, such as green beans, zucchini, cucumbers, peppers, and tomatoes, need to be harvested regularly to keep them producing and setting on more fruits. The plant will set fewer fruit if they are left on the plant too long and become large and over ripe.

Some leafy crops, such as spinach, leaf lettuce, and chard can be cut about an inch and a half to two inches above the ground and they will grow back. This can be done two or three times in the spring. These plants cannot withstand the heat and long days of the summer. At that time remove the plants entirely from the garden and plant another crop, such as green beans, for a fall harvest. Make sure there are enough days remaining in the growing season (before the first average fall frost in your area) for that crop to mature.

Seed packages, plant labels, and garden catalogs often give the “approximate” number of days for a crop to mature. Growing conditions, such as weather, moisture, and weed competition affect this number. So it should only be used as a guide. Work with the youth to figure this out together.

To help you to be watchful of the best stage for harvest, you may want to use the Approximate Harvest Dates chart found towards the end of this lesson.

**HARVEST TOOLS**

- Scissors are best for the students to cut leaf lettuce and spinach
- Pruning shears may work better for harvesting zucchini, squash, pumpkins, peppers and eggplant
- Buckets and/or bags for harvest
- Garden fork for carrots, potatoes and sweet potatoes
- Trowel for loosening soil around root crops and onions

**FOOD SAFETY AND CLEANING**

At harvest time, make sure everyone practices good food safety. Wash hands thoroughly before and after picking vegetables. The harvest containers should be clean and free from soil and old plant residue. Gallon-sized bucket can be lined with plastic grocery bags which will make hauling and clean up easier and insure clean harvest containers.

Clean your vegetables before you put them in the refrigerator. Rinse leafy vegetables (lettuce, spinach, chard, cabbage and kale) in clean cold water, preferably in a strainer to drain the excess moisture. Then store in airtight bags. Tomatoes, peppers, melons, squash, and cucumbers, can be rinsed off and air dried. Rinse and rub (not scrub) the soil from root crops such as carrots and beets. Soil residue on onions, garlic, potatoes and sweet potatoes should be rubbed off after they are cured (see Storing Vegetables). Never wash or soak them in water.

**STORING VEGETABLES**

Different crops have different storage needs. Some, such as potatoes and onions, need to be “cured” before they are stored. Curing is a treatment that increases their storage life. Once crops are harvested their quality starts to deteriorate. To slow that process, most vegetables need to be refrigerated almost immediately. If that is not possible, put them in a cool, shady location. Do not leave them sitting in bags in the hot sun.
**APPROXIMATE HARVEST DATES**

Please record the harvest information about the crops you are planting in your garden. You may find this information on the seed packet, the tag for the transplant, in garden catalogues, on the Internet, or at your local extension office. Besides using visual clues, this will help you to determine when the crops may be at the best stage to harvest.

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<td>28</td>
<td>April 20</td>
<td>May 18</td>
</tr>
<tr>
<td>Example: zucchini</td>
<td>48</td>
<td>June 15</td>
<td>August 3</td>
</tr>
</tbody>
</table>

---
# Harvesting and Storing Vegetables

(Adapted from ISU Extension Publication, PM 731 Harvesting and Storing Vegetables)

<table>
<thead>
<tr>
<th>CROP HARVEST GUIDE</th>
<th>HARVEST TIMES</th>
<th>OPTIMUM STORAGE CONDITIONS, °F</th>
<th>APPROX. STORAGE PERIOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNAP BEANS (bush or pole)</td>
<td>Pick often to keep plants producing more beans.</td>
<td>Cool Refrigerate: 40 - 45°</td>
<td>7 – 10 days</td>
</tr>
<tr>
<td>Harvest the pods when they are almost full-sized but before the seeds begin to bulge. Hand pick with small stem attached to the pod. Do not break pod.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BEETS</td>
<td>One time harvest. Clean garden area after all beets are harvested.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>4 months</td>
</tr>
<tr>
<td>Pull or dig beets when roots are 1 to 1½ inches in diameter. Cut tops to ½ inch above root.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROCCOLI</td>
<td>Tender side shoots, 1 to 3 inches across, will develop after the central head is removed. After those are harvested, remove the plants from the garden.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>10 – 14 days</td>
</tr>
<tr>
<td>Cut when flower heads are blue-green and about 6 to 7 inches across but before small yellow flower buds start to open. The stems below the flower head and small leaves are also very nutritious.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CABBAGE</td>
<td>One time harvest. Clean garden area after harvest.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>1 to 2 months</td>
</tr>
<tr>
<td>Cut when heads become large and solid. Don’t delay because heads are prone to cracking when they get large.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CANTALOupe (Muskmelon)</td>
<td>One plant can produce 2 to 5 fruit, not all at once. Check often once they start to mature.</td>
<td>Cool Refrigerate: 40 - 45°</td>
<td>1 to 2 weeks</td>
</tr>
<tr>
<td>The skin between the netting turns from green to orangish-yellow. The fruit will separate easily from the stem.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CARROTS</td>
<td>One time harvest. Clean garden area after harvest.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>3 or more months</td>
</tr>
<tr>
<td>Dig when roots are ¾ inch or more across. Be careful so that you don’t break the roots when digging. Remove tops to ½ inch above the root.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CROP HARVEST GUIDE

<table>
<thead>
<tr>
<th>CROP</th>
<th>HARVEST TIMES</th>
<th>OPTIMUM STORAGE CONDITIONS, °F</th>
<th>APPROX. STORAGE PERIOD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CUCUMBERS</strong></td>
<td>Pick slicing cucumbers when they are 6 inches long and while they are still bright green and firm. Cut fruit from the vine with pruning shears. Leave about ½ inch of stem attached to the fruit.</td>
<td>Check plants often once they start bearing. Keep fruit harvested for continuous production.</td>
<td>Moderate Refrigerate: 45 - 55°</td>
</tr>
<tr>
<td><strong>EGGPLANT</strong></td>
<td>Harvest anytime after the fruits are 2 inches across until they are 4 to 6 inches in diameter (depends on the variety). Light thumb pressure will leave a dent at the proper harvest stage. Cut from plant with pruning shears. Leave about 1 inch of stem on the fruit.</td>
<td>Check plants often once they start bearing. Keep fruit harvested for continuous production.</td>
<td>Moderate Refrigerate: 45 - 55°</td>
</tr>
<tr>
<td><strong>GARLIC</strong></td>
<td>Pull in mid-summer when bottom leaves begin to dry. Cure the bulbs in a warm ventilated area in single layers for 10 days. Remove the tops about 1 inch above the bulb.</td>
<td>One time harvest. Clean garden area after harvest.</td>
<td>Cold Refrigerate: 32 - 40°</td>
</tr>
<tr>
<td><strong>KOHLRABI</strong></td>
<td>Pull plants when stems are swollen to 2 to 3 inches in diameter. Remove leaves and roots.</td>
<td>One time harvest. Clean garden area after harvest.</td>
<td>Cold Refrigerate: 32 - 40°</td>
</tr>
<tr>
<td><strong>LETTUCE</strong></td>
<td>Leaf lettuce should be cut when the leaves are 4 to 6 inches long. Cut about 1 ½ inches above the ground for re-growth to occur.</td>
<td>Cut and it will come back for one or two more harvests, then remove spent plants.</td>
<td>Cold Refrigerate: 32 - 40°</td>
</tr>
<tr>
<td><strong>ONIONS (green)</strong></td>
<td>Any standard onion can be used as a green onion and harvested young. Harvest when 6 to 8 inches tall.</td>
<td>One time harvest. Clean garden area after harvest.</td>
<td>Cold Refrigerate: 32 - 40°</td>
</tr>
</tbody>
</table>
### General Information (Continued)

#### Harvesting and Storing Vegetables, Continued

(Adapted from ISU Extension Publication, PM 731 Harvesting and Storing Vegetables)

<table>
<thead>
<tr>
<th>Crop Harvest Guide</th>
<th>Harvest Times</th>
<th>Optimum Storage Conditions, °F</th>
<th>Approx. Storage Period</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Onions (dry)</strong></td>
<td>One time harvest. Clean garden area after harvest.</td>
<td>Cold (after curing) Refrigerate: 32 - 40°</td>
<td>3 months (use before they sprout)</td>
</tr>
<tr>
<td>Harvest when the tops fall over and begin to dry. Pull with tops on and dry them in a protected place for 3 to 4 days. Cut tops to 1 inch above the bulb and store in shady area in mesh bags or single layers for further curing until stems tighten up and outer scales are dry.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Peas</strong></td>
<td>Check plants often once they start producing seed pods. Keep pods harvested for extended production.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>1 to 2 weeks</td>
</tr>
<tr>
<td>Pick peas with edible pods such as snow peas when pods are just filled, but before the seeds become hard and starchy. Store peas in the pod. Harvest snap peas when the pods are beginning to plump and while the pods are still glossy and smooth.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Peppers</strong></td>
<td>Check plants often once they start bearing. Keep fruit harvested for continuous production.</td>
<td>Moderate Refrigerate: 45 - 55°</td>
<td>2 to 3 weeks</td>
</tr>
<tr>
<td>Harvest when the pepper is large, firm, and crisp. Fully ripe peppers are slightly sweeter and may be red, orange, yellow or other colors.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Potatoes</strong></td>
<td>One time harvest. Cure potatoes in a cool shady location for two weeks. Clean garden area after harvest.</td>
<td>Cool Refrigerate: 40 - 45°</td>
<td>New potatoes only store for a few weeks. Large, cured potatoes can be stored in a dark location for 3 or more months</td>
</tr>
<tr>
<td>New (small) potatoes can be dug in early summer when the vines are lush and green. Large potatoes are dug as soon as the plants die. Be careful not to cut the potatoes when digging by placing the fork at least 8 inches from the stem of the plant.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Radishes</strong></td>
<td>One time harvest. Clean garden area after harvest.</td>
<td>Cold Refrigerate: 32 - 40°</td>
<td>3 weeks</td>
</tr>
<tr>
<td>Pull when the roots are 1 to 1½ inches in diameter, remove tops about ½ inch above the root.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Crop Harvest Guide**

**Harvesting Information**

**Storing Information**
### CROP HARVEST GUIDE

<table>
<thead>
<tr>
<th>CROP HARVEST GUIDE</th>
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<th>OPTIMUM STORAGE CONDITIONS, °F</th>
<th>APPROX. STORAGE PERIOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPINACH</td>
<td>Harvest when leaves are 2 to 6 inches long. Cut about 1½ inches above the</td>
<td>Cold</td>
<td>1 to 2 weeks</td>
</tr>
<tr>
<td></td>
<td>ground for re-growth to occur.</td>
<td>Refrigerate: 32 - 40°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cut and it will come back for one or two more harvests, then remove spent</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUMMER SQUASH (Zucchini)</td>
<td>Cut squash from plant when they are 6 to 12 inches long. The rind is very</td>
<td>Cool</td>
<td>1 to 2 weeks</td>
</tr>
<tr>
<td></td>
<td>tender and scrapes easily. Scallop type (‘Patty Pan’) are harvested when</td>
<td>Refrigerate: 40 - 45°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 to 5 inches in diameter. Leave ½ inch stem on the fruit.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check plants often once they start</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>bearing. Keep fruit harvested for continuous production.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWEET CORN</td>
<td>Harvest by grasping the ear at its base and then twisting downward. It is</td>
<td>Cold</td>
<td>1 week</td>
</tr>
<tr>
<td></td>
<td>ready as soon as the silks are brown and dry at the ear tip.</td>
<td>Refrigerate: 32 - 40°</td>
<td></td>
</tr>
<tr>
<td>SWEET POTATOES</td>
<td>Harvest in late fall, just before frost, by digging with a garden fork. Be</td>
<td>Moderate</td>
<td>3 or more months</td>
</tr>
<tr>
<td></td>
<td>careful not to stab a tuberous root.</td>
<td>Refrigerate: 45 - 55°</td>
<td></td>
</tr>
<tr>
<td>TOMATOES</td>
<td>Pick any time from pink to fully red stage. Pick and remove stem from the</td>
<td>Cool room</td>
<td>4 to 7 days</td>
</tr>
<tr>
<td></td>
<td>fruit.</td>
<td>55 - 65°</td>
<td></td>
</tr>
<tr>
<td>WATERMELON</td>
<td>Harvest when fruits are full sized, rind is dull in appearance, and the</td>
<td>Moderate to cool room</td>
<td>2 to 3 weeks</td>
</tr>
<tr>
<td></td>
<td>bottom part touching the ground turns from greenish white to creamy yellow.</td>
<td>45 - 65°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leave 2-inch long stem attached to fruit.</td>
<td></td>
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</tr>
</tbody>
</table>
Collecting and Storing Seeds from Your Garden

D. Hatch

One of the first requirements for growing a successful garden is finding good seed from plant varieties that have been adapted to your area. Many companies provide such seed. When you calculate the value of the food you grow, you will find that high-quality seed is a bargain.

At some time, though, you may want to collect, store, and plant seed from your own garden rather than buy the seed. This fact sheet describes how to save seeds from a variety of plants.

Collecting seeds

Don’t save seeds from vegetables or flowers labeled “hybrid.” Seeds from hybrid varieties produce a mixture of plant types, most of which are inferior to the parent. Many varieties could be hybrids but may not be designated as such.

Seeds easily saved

Tomato
1. Save seed from the fully ripe fruit of the desired tomato plant.
2. Squeeze the seeds onto a paper towel or a piece of screen.
3. Leave the seeds at room temperature until they are thoroughly dry.

Pepper
Select a mature pepper, preferably one turning red, and allow it to turn completely red before extracting the seeds. Place seeds on a towel or a piece of screen until they are thoroughly dry.

Eggplant, husk tomato (groundcherry), garden huckleberry
Separate seeds from the mature fruit and dry thoroughly at room temperature.

Beans, peas, soybeans
1. Leave pods on the plant until they are “rattle dry.”
2. Watch the pods carefully because some varieties split and scatter the seeds when they are dry.
3. Pick dried pods and place them in a well-ventilated area at room temperature. When the pods are completely dry, remove the seeds.
4. To control possible weevil infestation, place seeds in a freezer for 24 to 30 hours.

Lettuce
Lettuce seeds are more difficult to collect, but you can save them.
1. Leave a plant or two to produce a seed stalk.
2. After the plant blooms and the flower forms a miniature “dandelion head,” gather the seeds.
3. Separate the seeds from the chaff by rubbing them with your fingers.

Seeds difficult to save

Vine crops: cucumber, melons, squash, and pumpkins
It usually doesn’t pay to save these seeds. Without controlled pollination, these crops cross with other varieties and sometimes other types. Muskmelons do not cross with cucumbers, however.

You can control pollination in your garden, but it requires careful attention. First, you need to distinguish between male and female flowers. Male blossoms are on a longer stalk and do not have a miniature fruit at the base as do female blossoms.

1. With careful observation, note the blossoms that will open the following day. They have a light yellow color and a distinct pointed tip.
2. In the evening, select male and female flowers on the same plant. With a paper clip for small flowers or a rubber band for larger flowers, prevent the flower from opening. Flowers open only early in the day.
3. In the morning, pluck the male blossom and touch the cluster of pollen (called anthers) to the center of the female flower (called the stigma).
4. Close the female flower again so bees can’t get in.
5. Tag the blossom.
6. Grow the fruit to maturity for the desired seed.

The fruit must be very ripe for seeds to germinate correctly. Cucumbers must be entirely yellow, and squash and pumpkin must be thoroughly mature. Separate the seeds from the fruit flesh and dry them at room temperature.

Biennials: carrot, beet, onion, and cabbage family

Biennials are questionable for seed collection. It may take considerable effort to carry over the plant root from the first season to the second year when seed stalks form. Many members of the
Storing seeds
Keep seeds in a labeled container or envelope in a cool, dry place where they are protected from insects. Storage life of seeds varies widely. Here is a guide:

- **Short-lived seeds** (1–2 years): corn, onion, parsley, parsnip, pepper
- **Intermediate seeds** (3–4 years): asparagus, bean, broccoli, carrot, celery, leek, pea, spinach
- **Long-lived seeds** (4–5 years): beet, chard, cabbage family (Brussels sprouts, cauliflower), turnip, radish, cucumber, eggplant, lettuce, muskmelon, pumpkin–squash group, tomato, watermelon

An ideal way to prepare seed for long-term storage is to place seed packets in a jar, seal the jar tightly and place it in a refrigerator or freezer. To help absorb moisture, place a small, cloth bag filled with dry, powdered milk beneath the seed packets in the bottom of the jar. Use about 1⁄2 cup of dry milk from a recently opened package.

Test germination
To test seeds for germination before planting:

1. Moisten two or three layers of paper towels.
2. Place 25 to 50 seeds on the towels and roll the towels loosely. Place them in a plastic bag.
3. Keep the towels in a warm place such as on a kitchen counter or on top of a water heater.
4. Some seed, such as radish, germinates in 2 or 3 days. Peppers can take 10 to 14 days. Observe the seed at 2-day intervals to determine the degree of germination.

For more information
Many OSU Extension Service publications may be viewed or downloaded from the Web. Visit the online Publications and Videos catalog at [http://eesc.oregonstate.edu](http://eesc.oregonstate.edu).

Copies of our publications and videos also are available from OSU Extension and Experiment Station Communications. For prices and ordering information, visit our online catalog or contact us by fax (541-737-0817), e-mail (puborders@oregonstate.edu), or phone (541-737-2513).
Eating from the Garden

Grade 5-6 May-June Lesson People’s Garden School Garden Pilot
Adapted with Permission from University of Missouri Extension

Garden Celebration

Knowledge Objectives:
• Students will review the importance of eating fruits and vegetables
• They will review where the fruits and vegetables are grown, the plant, and which season to plant them.
• They will recognize when plants are ready for harvest.

Behavioral Objectives:
• Students will choose a wider variety of fruits and vegetables
• They will harvest ripe fresh fruits and vegetables
• They will prepare the garden for fall planting.

Doing the lesson:

Nutrition Activities:

NOTE: You may want to do gardening activities first and do nutrition activities while vegetables are cooking.

1. Explain that today we are going to harvest our garden since we are near the end of school. We will be preparing some of the foods for tasting. Have the students share some of the things they learned this past year about nutrition and gardening.

2. Core Activity: Eating from the Garden Jeopardy
• Divide the students into two groups for a classroom of less than 20 students. Bigger classrooms can have more than two teams. Give each team a bell and instruct them to ring the bell if they know the answer. Each group should work together to come up with a category that they would like to start with. Remind your students that each answer must be given in the form of a question.

Supplies needed:
To Pick or Not to Pick (4-4)
Eating from the Garden Jeopardy game (13-2 or computer version) – SEPARATE FILE
Examples of produce from garden to show maturity
Gardening equipment
Ingredients and equipment for recipe preparation

Core activities:
Eating from the Garden Jeopardy (13-2)
Harvesting
Preparation of garden vegetables

Student handouts:
To Pick or Not to Pick (6-2)

Teacher references:
Vegetable Harvest and Storage-MU Guide
Putting Garden to Bed tip sheet
Eating from the Garden Jeopardy (13-2)

Advance Preparation:
Prepare cards and board for Jeopardy game and download electronic version from Peoples Garden website.
Gather materials and garden supplies.
• Have teams roll dice to see which one goes first. The first team chooses a category, and if applicable, an amount. Read the question that they have chosen. Allow them 30 seconds to consult for an answer. They should guess the answer in terms of a question. If they get it correct, they get the points, and if not, the other team gets a chance to "steal" the same amount of points if it guesses the right answer. Keep a tally on the chalkboard of team points.

• If desired, place the “Double Jeopardy” card behind one of the questions and let the team discuss their wager before reading the question to them.

• Allow each team a few minutes to discuss their wagers for "Final Jeopardy." Have them hand in their wagers so that no one can change it later. Give each team a few minutes to discuss their answers to the "Final Jeopardy" question and instruct them to write their answers down. When the time is up, the students share their answers and a winner is determined.

Gardening Activities:

Core Activity: Harvesting

1. Discussion: Do you remember why it is important to know when to harvest produce? We like to grow the biggest sized vegetables but don't want to sacrifice the taste. The quality of vegetables deteriorates when they are left in the garden too long. Vegetables picked too late can be tough, mushy, rotten, or lack taste. Garden produce picked too early lacks flavor or tastes "green" or unripe.

2. What are three important things to remember during harvest to ensure you have great tasting vegetables?
   a. Harvest your produce at the right stage of maturity.
   b. Handle vegetables gently.
   c. Store your vegetables in a cool place soon after harvest.

3. The time for harvesting depends on the climate, the variety, and the vegetable involved. For instance, tomatoes can be left on the vine until fully ripened or harvested when partially mature. They will continue to change color. Other crops such as winter squash and watermelon are not ready for harvest until after they are fully developed on the vine in the garden.

4. What does the phrase "days to maturity" mean and where can you find this for the vegetables you are growing? "Days to maturity" tells how many days it will take from planting the seed until harvest. This number can be found on the back of seed packets, in our Vegetable Planting Guide, in gardening books, and seed catalogs. But these numbers should be used only as an estimate of when to harvest because of varying weather conditions. (Show examples)

5. Determining when vegetables have reached peak quality is not easy.
   a. Keep a record of the varieties used and when they were planted.
   b. Know what your fruits and vegetables should look like when they mature. Review To Pick or Not to Pick (handout 4-4) and use reference Vegetable Harvest and Storage-MU Guide
c. Look for damage. Some vegetables are more susceptible to damage during harvesting than others, but avoiding bruises and cuts in handling is important with all your vegetables. Never eat any portion of a vegetable that is decayed or rotted.

d. Check your garden frequently during harvest time, for ripe produce. When harvesting, be very gentle with the produce to avoid bruising or damaging it. Many vegetables are very perishable and have a short storage life once they are harvested.

6. Use vegetables harvested from the garden to show examples of ripe, under-ripe and over-ripe vegetables or too large vegetables. Discuss different ways they could prepare the vegetables they grew.

7. There is something else we did after we harvested our vegetables last fall. Do you remember what we did? “Put our garden to bed”. You would not normally put a garden to bed this time of year because most people grow their garden all summer. But school is ending and no one will be tending the garden during the summer, what will happen to it? It will dry out, weeds will grow, insects will attack, produce will grow and no one will pick it. So we need to put our garden to bed this spring so that it will be ready for the new school year. We need to pull out all the plants and weeds. We need to rake up any fallen fruits or vegetables. We can add all these materials to our compost pile (if you have one.) Spread fallen leaves over the garden to a depth of 2 to 3 inches. Turn the leaves into the soil with a spading fork, and smooth the soil out some. Then we have put our “garden to bed.” for the summer and we will ready for next fall’s garden.

8. **Core Activity: Preparation of garden vegetables**

   Go out to garden and harvest enough vegetables that were grown for preparation and point out signs the vegetables are ready to pick. Prepare salad, Skillet Pizzas, Veggie Pillows, or lettuce wraps using julienned or finely chopped fresh vegetables from the garden and others if needed. Eat.

9. **Getting the Garden Ready for the Summer**

   a. Discuss with teacher what to do with additional produce grown. Options would be, prepare them a different way another day, give to cafeteria to use in lunch program, donate to a food bank, etc.

   b. **Note:** *If garden will not be tended over the summer, the teacher should take lead in disposing of rest of produce and cleaning out garden area and “putting to bed” until fall. (Use Putting Garden to Bed tip sheet).* Pull out the rest of the plants and weeds. Cover with leaves and turn into the soil. Divide the class into groups. Have groups assigned to the different jobs (soil prep, spreading compost, incorporating compost, weeding, harvesting, washing). Rotate students into different jobs.
Vegetable Harvest and Storage

Timely harvest and proper storage help maintain the quality and freshness of garden vegetables. This publication gives information on how and when to harvest vegetables, special harvest preparations, storage requirements, and appropriate length and kinds of storage.

The following terms are used in this publication:

- Light freeze: 28 to 32 degrees F
- Moderate freeze: 24 to 28 degrees F
- Severe freeze: Less than 24 degrees F

You should recognize that ideal storage conditions for many vegetables are not attainable around the average home or farm. It is important, therefore, to recognize the limitations of the best storage available.

Refrigerators can be used for storage. If two refrigerators are available, one can be kept at a cold temperature (32 to 40 degrees) and the other at a cool temperature (45 to 50 degrees). If there is only one refrigerator with the control set for normal operation, the temperature in the center storage section is usually between 38 and 42 degrees. Check the setting of the temperature control by placing a thermometer in different places in the refrigerator. Remember: Opening the refrigerator door frequently raises the temperature inside.

Basements are also possible storage places. Temperatures in most heated or air-conditioned basements will usually be 65 degrees or warmer in summer and 60 degrees or cooler in winter. Separate sections can be partitioned to vary the temperature and humidity. You can use outdoor air, dirt floors or wetted sacks to vary the temperature and humidity needs. Unheated basements, if well ventilated, can provide good storage conditions for some vegetables.

Different vegetables require different temperature and humidity levels for proper storage.

<table>
<thead>
<tr>
<th>Root crops</th>
<th>Cold, moist storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beets</td>
<td>32 to 40 degrees F</td>
</tr>
<tr>
<td></td>
<td>90 to 95 percent relative humidity</td>
</tr>
</tbody>
</table>

- Beets
  Begin harvest when beet is 1 inch in diameter or smaller for baby beets. Main harvest is when beets are 2 to 3 inches. Tender tops make excellent greens regardless of the size of the root ball. Harvest spring-planted beets before hot weather. Harvest fall beets before the first moderate freeze. For storage, wash roots, trim tops to \( \frac{1}{2} \) inch, place in perforated plastic bags and store in refrigerator, cold moist cellar or pit. Storage life is two to four months.

- Carrots
  Harvest spring carrots before hot weather. Baby carrots may be harvested when roots are 3 inches long. Fall-planted carrots should be harvested before the first moderate freeze. For storage, wash roots, trim tops to \( \frac{1}{2} \) inch, place in perforated plastic bags and store in refrigerator, cold moist cellar or pit. Storage life is two to four months. With a heavy layer of mulch, carrots may also be overwintered outdoors in the ground.

- Horseradish
  Harvest after several severe freezes. Store in the ground all winter. Mulch with straw or leaves and dig, when needed.

- Parsnips
  Harvest in late fall after several moderate freezes. Exposure to cold develops the sweet flavor. For storage requirements, see carrots.

- Potato, Irish
  Harvest in July when the tops have yellowed or died. Do not leave in ground exposed to high
soil temperatures from sun. Wash potatoes and remove the diseased or damaged ones. Cure for about a week in a shaded, well-ventilated place (open barn, shed, garage). Avoid exposing tubers to light. Store in as cool a place as possible at this time of year. You are not likely to find ideal storage conditions (40 degrees, 85 to 90 percent relative humidity) at this time of year other than commercial cold storage. Cool basements are probably the best storage available. Keep humidity high and provide good ventilation. Storage time is two to four months.

• **Radish**
  Harvest when \( \frac{1}{2} \) to 1 inch in diameter. Wash roots, trim both taproot, and tops and store in plastic bags in a refrigerator for up to a month. Winter or black radishes are stored the same as carrots.

• **Salsify**
  See parsnips for harvest and storage.

• **Turnip**
  Turnips can be harvested from the time they are 1 inch in diameter. They are best as a fall crop and can withstand several light freezes. Store the same as carrots. Turnip greens may be harvested and used the same as beet greens.

**Cole crops (cabbage group)**

• **Broccoli**
  Harvest terminal head while florets are still tight and have a good green color. Smaller side heads will develop. Store in perforated plastic bags for up to one week in the refrigerator. Freeze any surplus. Best quality will be found in shoots that are harvested during cool weather.

• **Brussels sprouts**
  Harvest the sprouts (small heads) when they are firm — begin from the bottom of the plant. Sprouts can stand several moderate freezes. Harvest all sprouts before the first severe freeze and store in the refrigerator in perforated bags for up to three weeks. Freeze any surplus.

• **Cabbage**
  Harvest when heads are solid. Remove loose outer leaves. Store cabbage in refrigerator, cold cellar or outdoor pit in plastic bags for up to two months.

• **Cauliflower**
  Tie outer leaves above the head when curds are about 1 to 2 inches in diameter (except colored types). Heads will be ready for harvest in about two weeks. Cauliflower may be stored in perforated plastic bags in the refrigerator for up to two weeks. Freeze any surplus.

• **Chinese cabbage**
  Grows best in the fall, although varieties that mature in less than 55 days can be planted in early spring. Harvest head after the first moderate frost in the fall and store in perforated plastic bags in the refrigerator, cold cellar or outdoor pit. Chinese cabbage will keep for up to two months. Harvest spring cabbage when heads solidify, but before a seed stalk forms.

• **Kohlrabi**
  For standard types, harvest when the swollen stems are 2 to 3 inches in diameter. Stems become woody if left too long before harvest or if grown under poor conditions. Giant, heirloom types may reach 1 foot in diameter and still retain high quality. Cut off root and leaf stems, and store in plastic bags as indicated for carrots. Storage life is two to four weeks.

**Greens**

• **Swiss chard**
  This is a summer green that is harvested continuously. Merely break off the outer leaves. Swiss chard is a beet relative developed for its top. A spring planting will provide greens from early summer to the first moderate freeze. Store in plastic bags up to two weeks in the refrigerator.

• **Collards (kale, mustard, spinach)**
  Harvest the leaves and leaf stems of greens when they reach suitable size. Either harvest the whole plant or the outer, larger leaves. Greens do not store well, but may be kept in plastic bags in the refrigerator for up to two weeks. Freeze any surplus.

**Salads**

• **Endive (Escarole)**
  Harvest whole plant. Wash thoroughly to remove soil and sand. Gather leaves together and tie with rubber band. Store in plastic bags in refrigerator for up to three weeks.
• **Lettuce**
  Head, semi-head and leaf lettuce can be stored for up to two weeks in perforated plastic bags in the refrigerator. Individual leaves may be harvested at any stage of development before the plants bolt (go to seed). For best quality, successive plantings at two-week intervals are suggested.

• **Parsley**
  Parsley will overwinter if planted in a protected place like a cold frame. If planted in the open, it can be carefully lifted with a ball of soil just before the soil freezes, potted and taken into the house in a cool, sunny room and harvested for several weeks. Parsley leaves will keep in plastic bags in the refrigerator for about one week.

**Legumes**

• **Lima beans**
  Harvest when pods have filled. Harvest tender limas when a bit immature and harvest meaty limas when mature. Shelled limas can be stored in perforated plastic bags in the refrigerator for about a week. Surplus limas can be canned or frozen.

• **Garden peas**
  Harvest when pods have filled. Harvest tender peas when a bit immature and harvest meaty peas when mature. Unshelled peas can be kept in a perforated plastic bag in the refrigerator for about a week. Surplus peas can be kept in a refrigerator for up to two weeks. Oriental or snow pea types are harvested when pods are full size, but before the peas inside begin to swell. Edible podded or snap peas are harvested when pods have filled out but before the peas inside become starchy.

• **Southern peas (Crowder, Purple Hull, etc.)**
  For fresh use, freezing or canning, harvest when seeds are large and plump, but moist. Either shelled or unshelled peas may be stored in the refrigerator for several days.

**Other vegetables**

• **Asparagus**
  Harvest by snapping 6- to 12-inch spears off at ground level, but before the top begins to fern out. Store in plastic bag in refrigerator for up to one week. Freeze or can any surplus.

• **Onions, green**
  Harvest green onions when they attain sufficient size. Cut off roots and remove top, leaving 1 inch of green. Place in plastic bag and store in refrigerator for up to two weeks.

• **Rhubarb**
  Harvest leaf stalks when ½ to 1 inch in diameter. Do not use leaves. Rhubarb can be stored in perforated plastic bags for up to three weeks in the refrigerator. Surplus rhubarb can be frozen.

• **Sweet corn**
  Harvest sweet corn when kernels are plump and tender. Silks will be dry and kernels filled. To check a few ears for maturity: Open top of ear and press a few kernels with thumbnail. If milky juice exudes, it is ready for harvest. Harvest at peak of quality, husk to conserve space and store in plastic bags for no more than two days in the refrigerator. The new super sweet varieties will store for a week or more. Freeze or can surplus corn. Baby corn may be harvested just as silks emerge, before the ear is 3 inches long.

  **Cool, moist storage**

  45 to 50 degrees F

  80 to 90 percent relative humidity

**Vine crops**

• **Cantaloupe (muskmelon)**
  Harvest when the stem slips easily from the fruit. Lift the melon — if ripe it should separate easily from the vine. Store ripe melons in the refrigerator in a plastic bag for up to 10 days. Try a few boxes of frozen melon balls.

• **Squash, summer**
  Harvest when fruit is young and tender. Skin should be easily penetrated with the thumbnail. Store for up to a week in a perforated plastic bag in the refrigerator.

• **Cucumber**
  Harvest cucumbers before seeds become half-size. This will vary with variety. Most varieties will be 1½ to 2½ inches in diameter and 5 to 8 inches long. Pickling cucumbers will be a bit more blocky and not as long as slicers. Store slicing cucumbers in the warmest part of the refrigerator (45 to 50 degrees). Place in plastic bag. Storage life is about one week. Pickling cucumbers should be cooled...
quickly in ice water and can be kept up to two days in a plastic bag in the refrigerator.

- **Watermelon**
  Harvest when underside of fruit turns from whitish to yellowish. The tendril at the juncture of the fruit stem and the vine usually dies when the fruit is mature. Thumping an immature melon gives a ringing metallic sound, while a mature melon gives a dull thud. Watermelons will store at room temperature for about a week and at a temperature of 45 to 50 degrees for two or three weeks.

**Other vegetables**

- **Eggplant**
  Harvest when fruits are nearly full grown, but color is still bright. Eggplants are not adapted to long storage. Keep in warmest part of refrigerator (45 to 50 degrees) for about a week.

- **Beans, green**
  Bean pods will be most tender when the small seed inside is one-fourth normal size. The pods become more fibrous as the beans mature. Harvest before pods begin to swell because of the developing bean seeds inside. Store green beans up to one week in perforated plastic bags in the warmest part of the refrigerator. Can or freeze surplus.

- **Okra**
  Harvest okra pods when they are 2 to 3 inches long. Over-mature pods are woody. Store in plastic bags in the warmest part of the refrigerator for about one week. Freeze surplus.

- **Peppers, sweet**
  Harvest when fruits are firm and full size. If red, yellow or other colored fruits are desired, leave on plant until mature color develops. Sweet peppers can be stored for two to three weeks in the warmest part of the refrigerator in plastic bags.

  **Cool, dry storage**
  32 to 55 degrees F
  50 to 60 percent relative humidity

- **Onions, dry**
  Harvest onions when the tops have fallen over and the necks have shriveled. Remove tops, place in shallow boxes or mesh bags and cure in open garage or barn for three to four weeks. Store in mesh bags in as cool a place as can be found in midsummer (32 to 35 degrees). During humid (muggy) weather, keep ventilated.

- **Peppers, hot**
  Pull plants late in the season and hang to dry in sun or a warm place. Store in a dry, cool place (usually a basement).

  **Warm, dry storage**
  55 to 60 degrees F
  60 to 70 percent relative humidity

- **Pumpkins, winter squash**
  Harvest pumpkins and winter squash when the skin is hard and the colors darken. Both should be harvested before frost. Remove the fruit from the vine with a portion of the stem attached. Store on shelves in a single layer, so air can circulate around them.

  **Warm, moist storage**
  55 to 60 degrees F
  80 to 85 percent relative humidity

- **Sweet potatoes**
  Harvest in fall before frosts and freezing temperature. Handle carefully in the digging process. Cure for one week at temperature of 80 to 85 degrees. Ideal storage is at 55 degrees and 85 percent relative humidity. (This might be accomplished in a basement with ventilated boxes covered with periodically moistened burlap sacks.)

- **Tomato**
  Ripe tomatoes will keep for a week at 55 to 60 degrees. Green, mature tomatoes, harvested before frost, should be kept at a temperature between 55 and 70 degrees. For faster ripening, raise temperature to 65 to 70 degrees. Mature green tomatoes should approach normal size and have a whitish, green skin color. Keep mature green tomatoes for three to five weeks by wrapping each tomato in newspaper and inspecting for ripeness each week. Do not store tomatoes in the refrigerator.

This handout is an adapted version of University of Missouri Horticulture Guide C6226.
**To Pick or Not to Pick**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Harvest these crops when:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beans</strong></td>
<td>• Pods are firm, crisp and not wrinkled.</td>
</tr>
<tr>
<td></td>
<td>• Seeds are not bulging.</td>
</tr>
<tr>
<td></td>
<td>• Snaps when you break the pod in half.</td>
</tr>
<tr>
<td><strong>Beets and turnips</strong></td>
<td>• Roots are at least 1 inch in diameter – up to 2 to 4 inches.</td>
</tr>
<tr>
<td></td>
<td>• Trim tops to ( \frac{1}{2} ) inch.</td>
</tr>
<tr>
<td></td>
<td>• Greens may also be harvested while tender.</td>
</tr>
<tr>
<td><strong>Corn</strong></td>
<td>• Ears of corn are well-filled with dark green husks and brown silks.</td>
</tr>
<tr>
<td></td>
<td>• Kernels have milky fluid when punctured with a fingernail.</td>
</tr>
<tr>
<td><strong>Cucumbers</strong></td>
<td>• Any stage before they turn yellow.</td>
</tr>
<tr>
<td></td>
<td>• Small cucumbers are generally used for pickles.</td>
</tr>
<tr>
<td></td>
<td>• Larger ones (less than 8 inches) are for slicing.</td>
</tr>
<tr>
<td>**Honeydew/</td>
<td>• Shake the honeydew — you should hear the seeds rattle.</td>
</tr>
<tr>
<td>Cantaloupe**</td>
<td>• Strong cantaloupe smell.</td>
</tr>
<tr>
<td><strong>Lettuce</strong></td>
<td>• Choose leaves at desired size any time before it goes to seed.</td>
</tr>
<tr>
<td></td>
<td>• Snap or cut leaves or harvest whole heads.</td>
</tr>
<tr>
<td></td>
<td>• Leave 2 inches for plant to reproduce.</td>
</tr>
<tr>
<td><strong>Okra</strong></td>
<td>• Pods are 2 to 3 inches long.</td>
</tr>
<tr>
<td></td>
<td>• Okra gets tough and woody quickly.</td>
</tr>
<tr>
<td></td>
<td>• Short hairs on the pods can irritate bare skin.</td>
</tr>
<tr>
<td></td>
<td>• A knife is useful to cut the pods off the plant.</td>
</tr>
<tr>
<td><strong>Onions</strong></td>
<td>• Green onions are ready for harvest at any size.</td>
</tr>
<tr>
<td></td>
<td>• Bulb onions are harvested when the tops fall over and are yellowish.</td>
</tr>
<tr>
<td></td>
<td>• After digging bulb onions, leave them out in the sun to dry for a few days to toughen the skin.</td>
</tr>
<tr>
<td><strong>Peppers</strong></td>
<td>• Any size while they are firm, crisp and unwrinkled.</td>
</tr>
<tr>
<td></td>
<td>• Leave them on the plant to mature and develop a color.</td>
</tr>
<tr>
<td></td>
<td>• Use rubber gloves when harvesting hot peppers to protect skin from irritation.</td>
</tr>
<tr>
<td><strong>Radishes</strong></td>
<td>• Select ( \frac{1}{2} ) to 1 inch in diameter.</td>
</tr>
<tr>
<td></td>
<td>• Trim taproot and tops.</td>
</tr>
<tr>
<td><strong>Snap peas</strong></td>
<td>• Pods are full-size, but peas inside have not swollen.</td>
</tr>
</tbody>
</table>

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University of Missouri Extension, Eating from the Garden, 2010
To Pick or Not to Pick (continued)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Harvest these crops when:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer squash</td>
<td>• Squash is 6 to 8 inches long.</td>
</tr>
<tr>
<td></td>
<td>• Pick often, as they grow quickly in hot weather.</td>
</tr>
<tr>
<td></td>
<td>• If squash gets too big, it will be tough and seedy, but can be grated for baked breads.</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>• Fruit are firm with some color.</td>
</tr>
<tr>
<td></td>
<td>• They have the best flavor when they fully develop color on the plant.</td>
</tr>
<tr>
<td>Watermelon</td>
<td>• Makes a thud sound when you thump it.</td>
</tr>
</tbody>
</table>
Putting the Garden to Bed

- After harvesting, remove debris from garden.

- Remember to remove the entire root so plants do not grow back.

- Incorporate compost (if available).
Eating From the Garden
A nutrition and gardening program

Eating From the Garden
Jeopardy

Setting up the game

• Set up the game before the students arrive. In Jeopardy, the questions in the game are statements called “clues,” and the answers are given in the form of a question. Create a board with the topics listed across the top. Place the game cards on the game board under the proper categories and with the money-side up in ascending order ($100 at the top to $500 at the bottom).

Game Play

• In a class of less than 20 students, divide the students into two teams. Classes with more than 20 students can have more than two teams.
• Give each team a bell and instruct them to ring the bell if they know the answer. Introduce the categories and instruct the student that their answers must be in the form of a question.
• Have each team work together to come up with a category that they would like to start with. Then have teams roll dice to see which one goes first.
• Have the first team choose a category and an amount. Read the chosen clue. Allow the team that rings their bell first to give their answer — in the form of a question. If they answer correctly, they get the points and get to choose the next clue. If they answer incorrectly, give the other team(s) the opportunity to answer. The team that answers correctly chooses the next clue. In no one answers correctly, the team that chose that clue chooses the next clue.
• Tally team points on the chalkboard. Continue play in the above manner until all the clues have been read.
• If desired, place the Daily Double card behind one of the clues. Let the team that chooses that clue decide on their wager before you read the clue. Then read the chosen clue, and allow the team 30 seconds to consult on an answer. If they get it correct, they get the points; if not, the other team gets a chance to “steal” the points if they give the correct answer.
• After all the clues have been read, allow each team a few minutes to decide on their wagers for Final Jeopardy. Have them hand in their wagers so they cannot change them later. Read the Final Jeopardy clue, and give the teams a few minutes to discuss and write down their answers. When the time is up, the students share their answers, points are tallied, and a winner is determined.

Variations

• Have teams take turns answering questions.
• Make the game noncompetitive by having students work as a group to complete the game.
Eating From the Garden Jeopardy

Category cards

Nutrition
Food Safety
Physical Activity
Planting
Garden Care
Plant Science
# Eating From the Garden Jeopardy

## Clue cards

<table>
<thead>
<tr>
<th>Fruits, vegetables, grains, protein and dairy</th>
<th>Half of my plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition</td>
<td>Nutrition</td>
</tr>
<tr>
<td>Water, food and air</td>
<td>Nutrients we want to see less of on food labels</td>
</tr>
<tr>
<td>Nutrition</td>
<td>Nutrition</td>
</tr>
<tr>
<td>Nutrient that gives us energy</td>
<td>What you should do just before eating</td>
</tr>
<tr>
<td>Nutrition</td>
<td>Food Safety</td>
</tr>
</tbody>
</table>
**Eating From the Garden Jeopardy**

**Clue cards**

<table>
<thead>
<tr>
<th>$200</th>
<th>$100</th>
</tr>
</thead>
<tbody>
<tr>
<td>$400</td>
<td>$300</td>
</tr>
<tr>
<td>$100</td>
<td>$500</td>
</tr>
</tbody>
</table>
## Eating From the Garden Jeopardy

### Clue cards

<table>
<thead>
<tr>
<th>Food Safety</th>
<th>Food Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>What we should use to wash fresh fruits and vegetables before we eat them</td>
<td>We remove these when we wash fresh fruits and vegetables</td>
</tr>
<tr>
<td>Items we should use to clean counters and cutting boards</td>
<td>A method of keeping fruits and vegetables fresh longer</td>
</tr>
<tr>
<td>Physical Activity</td>
<td>Physical Activity</td>
</tr>
<tr>
<td>A physical activity that burns calories and encourages you to eat healthfully</td>
<td>Forms of active play</td>
</tr>
</tbody>
</table>
### Eating From the Garden Jeopardy

**Clue cards**

<table>
<thead>
<tr>
<th>$300</th>
<th>$200</th>
</tr>
</thead>
<tbody>
<tr>
<td>$500</td>
<td>$400</td>
</tr>
<tr>
<td>$200</td>
<td>$100</td>
</tr>
</tbody>
</table>
## Eating From the Garden Jeopardy

### Clue cards

<table>
<thead>
<tr>
<th>Being active helps you achieve this</th>
<th>The number of times your heart beats in a minute</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical Activity</strong></td>
<td><strong>Physical Activity</strong></td>
</tr>
<tr>
<td>The amount of time you should spend in active play every day</td>
<td>Plants that are good for a school garden</td>
</tr>
<tr>
<td><strong>Physical Activity</strong></td>
<td><strong>Planting</strong></td>
</tr>
<tr>
<td>Tools used to prepare soil for planting</td>
<td>This grows into a new plant when placed in the right environment</td>
</tr>
<tr>
<td><strong>Planting</strong></td>
<td><strong>Planting</strong></td>
</tr>
</tbody>
</table>
# Eating From the Garden Jeopardy

**Clue cards**

<table>
<thead>
<tr>
<th>$400</th>
<th>$300</th>
</tr>
</thead>
<tbody>
<tr>
<td>$100</td>
<td>$500</td>
</tr>
<tr>
<td>$300</td>
<td>$200</td>
</tr>
</tbody>
</table>
# Eating From the Garden Jeopardy

**Clue cards**

<table>
<thead>
<tr>
<th>Planting seeds indoors under “grow lights” and later moving the seedlings inside</th>
<th>Root vegetables that are planted from seedlings in the spring and harvested in the fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs to do after a garden is planted</td>
<td>Decayed dried leaves, fruit and vegetable scraps, other organic matter and water</td>
</tr>
<tr>
<td>A plant that is growing where it is not wanted</td>
<td>Removing small seedlings from a garden to make room for others to grow</td>
</tr>
</tbody>
</table>

---

University of Missouri Extension, Eating from the Garden, 2010
Eating From the Garden Jeopardy

Clue cards

$500

$400

$200

$100

$400

$300
Eating From the Garden Jeopardy

Clue cards

<table>
<thead>
<tr>
<th>Garden Care</th>
<th>Plant Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removing plants from a garden and working in leaves or compost</td>
<td>The part of a plant that absorbs water and nutrients from the soil</td>
</tr>
<tr>
<td>The process by which plants make their own food from air, water and sunlight</td>
<td>The process by which a seed takes in water and swells, and the embryo starts to grow</td>
</tr>
<tr>
<td>The process by which plants use colors and smells to attract insects and animals to produce the fruit of the plant</td>
<td>Animal that helps break down nutrients in the soil</td>
</tr>
</tbody>
</table>

Plant Science

Plant Science

Plant Science

Plant Science
Eating From the Garden Jeopardy

Clue cards

- $100
- $500
- $300
- $200
- $500
- $400
Eating From the Garden Jeopardy

Additional cards

DAILY DOUBLE

Colorful foods that give us lots of vitamins and minerals and very little fat, sugar or sodium

FINAL JEOPARDY CLUE
Eating From the Garden Jeopardy

Additional cards

DAILY DOUBLE

FINAL JEOPARDY ANSWER

What are fresh fruits and vegetables?
# Eating From the Garden

A nutrition and gardening program

## Eating From the Garden

### Jeopardy Answer Key

#### Nutrition

<table>
<thead>
<tr>
<th>Score</th>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Fruits, vegetables, grains, protein and dairy (What are the food groups?)</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>Half of my plate (How much of my plate should contain fruits and vegetables?)</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>Water, food and air (What do people and plants need for growth?)</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>Nutrients we want to see less of on food labels (What are fat, sugar and sodium?)</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>Nutrient that gives us energy (What is carbohydrate?)</td>
<td></td>
</tr>
</tbody>
</table>

#### Physical Activity

<table>
<thead>
<tr>
<th>Score</th>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>A physical activity that burns calories and encourages you to eat healthfully (What is gardening?)</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>Forms of active play (What are riding a bike and playing sports?)</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>Being active helps you achieve this (What is a healthy weight?)</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>The number of times your heart beats per minute (What is your pulse?)</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>The amount of time you should spend in active play every day (What is 60 minutes?)</td>
<td></td>
</tr>
</tbody>
</table>

#### Food Safety

<table>
<thead>
<tr>
<th>Score</th>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>What you should do just before eating (What is wash your hands?)</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>What we should use to wash fresh fruits and vegetables before we eat them (What are cold water and a scrub brush?)</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>We remove these when we wash fruits and vegetables (What are dirt, insects and pesticides?)</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>Items we should use to clean counters and cutting boards (What are soap, water and a sanitizing solution?)</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>A method of keeping fruits and vegetables fresh longer (What is freezing?)</td>
<td></td>
</tr>
</tbody>
</table>

#### Planting

<table>
<thead>
<tr>
<th>Score</th>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Plants that are good for a school garden (What are radishes, lettuce and other cool-season crops?)</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>Tools used to prepare soil for planting (What are shovels and rakes?)</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>This grows into a new plant when placed in the right environment (What is a seed?)</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>Planting seeds indoors under “grow lights” and later moving the seedlings inside (What is transitioning?)</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>Root vegetables that are planted from seedlings in the spring and harvested in the fall (What are sweet potatoes?)</td>
<td></td>
</tr>
</tbody>
</table>
## Eating From the Garden

### Jeopardy Answer Key (continued)

<table>
<thead>
<tr>
<th>Garden Care</th>
<th>Plant Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 Jobs to do after a garden is planted <em>(What are watering and weeding?)</em></td>
<td>100 The part of a plant that absorbs water and nutrients from the soil <em>(What are roots?)</em></td>
</tr>
<tr>
<td>200 Decayed dried leaves, fruit and vegetable scraps, other organic matter and water <em>(What is compost?)</em></td>
<td>200 The process by which plants make their own food from air, water and sunlight <em>(What is photosynthesis?)</em></td>
</tr>
<tr>
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</tr>
</tbody>
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### Final Jeopardy

Colorful foods that give us lots of vitamins and minerals and very little fat, sugar or sodium *(What are fruits and vegetables?)*
Nutrition & Gardening Jeopardy

EATING FROM THE GARDEN
Nutrition
Food Safety
Physical Activity
Planting
Garden Care
Plant Science
Guides for healthy eating.
What are the food groups?
Half the Plate.
How much fruits and vegetables should we eat?

$200
Water, food, and air
What people and plants need for growth

$300
Nutrient that gives us energy
What is carbohydrate?
Nutrients we want to see less of on the food label
What are fat, sugar, and sodium?
The first thing you should do before eating.
What is washing your hands?
What we should use to wash fresh fruits and vegetables before we eat them.
What are cold water and a scrub brush?
We remove these when we wash fresh fruits and vegetables.
What are dirt, insects, and pesticides?
We should use these to clean counters and cutting boards.
What are soap, water, and a sanitizing solution?

$400
Method to keep fresh fruits and vegetables longer.
What is freezing?
A physical activity that burns calories and encourages you to eat healthy.
What is gardening?
This is a form of active play.
What is riding your bike or playing sports?

$200
Being active helps you to achieve this.
What is a healthy weight?
The number of times your heart beats in a minute.
What is your pulse?
Amount of time you should spend in active play every day.
What is 60 minutes?

$500
Plants that are good for a school garden.
What are radishes and lettuce and other cool season crops?
Tools used to prepare the soil for planting.
What are shovels and rakes?
Grows into a new plant when placed in the right environment.
What is a seed?
Planting seeds indoors under “grow lights” and moving them outside.
What is transplanting?

$400
Root vegetables that are planted from seedlings in the spring and harvested in the fall.
What are sweet potatoes?
Jobs to do after the garden, is planted.
What are watering and weeding?
Decayed dried leaves, fruits and vegetable scraps, water, and other organic matter.
What is compost?
A plant that is not growing where it is supposed to be.
What is a weed?
Removing small seedlings from the garden to make room for others to grow.
What is thinning?
Removing plants from the garden and working in leaves or compost.
What is “putting the garden to bed”? $500
Part of the plant that absorbs water and nutrients from the soil.
What are roots?
Process where the plants make their own food from air, water, and sunlight.
What is photosynthesis?
Process by which the seed takes in water, swells, and the embryo starts to grow.
What is germination?
Plants use colors and smells to attract insects and animals to produce the fruit of the plant.
What is pollination?

$400
Animal that helps break down nutrients in the soil.
What is a worm?

$500
How much you do want to wager?
Colorful foods that give us lots of vitamins and minerals and very little fat, sugar, or sodium.
What are fresh fruits and vegetables?