Lesson Six: Mulching for Water Conservation and Cabbage
For February

“Magic of Mulch” and “Mulch More” activities from GROWING IN THE GARDEN: OUTDOOR CLASSROOM, Iowa State University Extension and Outreach; and “Cabbage” from HARVEST OF THE MONTH: Network for a Healthy California.

Students learn about the benefits of different types of mulches and the difference between organic and inorganic materials. They learn about how much mulch to use in the garden. They have a chance to go out to the garden and apply mulch. This multi-part lesson also 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 how to mulch the garden; 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 3

February: The Magic of Mulch and Cabbage

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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 3, 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


3. Food Safety

   The [FIGHT BAC: Six Steps to Safer Fruits and Vegetables](http://www.fightbac.org/six-steps-safer-fruits-and-vegetables) 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.fightbac.org/four-simple-steps-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.

   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 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 and related documents to prepare for the nutrition lesson.

5. Garden Journals

   Continue your garden journals or records. Have students make a three-column KWL Chart (chart to track what a student knows (K), wants to know (W) and has learned (L) about the topic) 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 Magic of Mulch 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 ‘Mulch’ More activity 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
Do the ‘Mulch’ More activity in and around the students’ gardens.
Safe Handling of Fresh Fruits and Vegetables

PROVIDED BY THE PARTNERSHIP FOR FOOD SAFETY EDUCATION

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!®

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.
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®

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

FDAs 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.

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>Ground Meat and Meat Mixtures</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>Fresh Beef, Veal, Lamb</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>Fresh Pork</td>
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</tr>
<tr>
<td>Eggs and Egg Dishes</td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td>Cook until yolk and white are firm</td>
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</tr>
<tr>
<td>Seafood</td>
<td></td>
</tr>
<tr>
<td>Fin fish</td>
<td>145°F or flesh is opaque and separates easily with fork</td>
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<tr>
<td>Shrimp, lobster and crab</td>
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<td>Clams, oysters and mussels</td>
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</tr>
<tr>
<td>Scallops</td>
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*Allow three-minute rest time

Grade 3 February Mulch/Cabbage Lesson
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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 40ºF 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 40ºF or below. The freezer temperature should be 0ºF 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 90ºF).
- 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.
Here are some recommendations for doing the activities identified above. The question responses in normal font can be read to the students, the responses in italics are guidelines for the teacher.

1. Ask the students if they know the difference between “organic” and “inorganic” materials. They may remember this from the composting lessons. Use the following simplified descriptions and garden questions as your reference.

a. Organic substances or materials come from living things such as plants, fruits, vegetables, and animals. In chemistry, organic compounds contain carbon.

b. What organic things are found in a garden? Fruits, vegetables, plants, animal droppings, insects, compost, and some types of mulch

c. Now that we know about organic things; how would you describe something that is inorganic? Inorganic substances and materials do not come from fruits, vegetables, plants, or animals and do not contain carbon.

d. What do you think inorganic things come from? Inorganic things come from anything other than organic matter, most start with mineral sources.

e. What is an example of a mineral source? Rocks are mineral sources and rocks break down into soil. So rocks and soil in your garden are examples of inorganic materials.

2. Proceed with The Magic of Mulch activity.

3. Please use the following questions to apply the activity to the students’ gardens.

a. Should we mulch our gardens or garden walkways? Why? You may want to refer back to the question in the activity, “What is it (mulch) used for?”

If you are using the square foot gardening method, think about reasons why mulch is not necessary.

If you are using raised bed gardens, ask the students to think about reasons why mulch is good for the walkways around the gardens. Their answers may include: the mulch will hold the water in the soil and hold the soil in place, 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, and mulch will help to prevent weeds – especially if there is landscape fabric underneath it.
b. What kind of mulch should we use? Do you want to experiment with different kinds of mulch? Where should we put the mulch?

4. Read the ‘Mulch’ More activity and work with the students to figure out how much mulch you will need and how you can acquire the mulch. Decide when would be a good date to mulch your garden and why. The date will give everyone a goal to work towards.
MATERIALS - Sandwich-sized zipper lock bags that individually contain the following:
  - bark mulch, grass clippings, gravel, river rock mulch, sawdust, pine needles,
  - leaves, carpet samples, black plastic (from a garbage bag), newspaper,
  - and other mulching materials
- Permanent marker to label contents of bags
- 2 signs (one labeled “organic” and the other “inorganic”)

What is mulch and where have you seen it?
Mulch can be wood and leaf pieces, grass clippings, rubber tire pieces, or any other small pieces used to cover the ground around plants and objects or to make walkways.

What is it used for?
To conserve soil moisture, to prevent weed growth, to make a garden look nice, to cover a pathway, etc.

We are going to learn more about the benefits and different types of mulches. Some mulches are made of natural, formerly living materials. We call those “organic” materials. Some mulches are made of “inorganic” materials, which are from nonliving things.

The day of the lesson, make two signs – organic and inorganic. Set all the bags, label side up, on the floor. Select one student to be the sorter and two students to be recorders. The sorter will hold up each sample and will be instructed by the other students which pile each sample should go to. You may want to add a little information about each sample if there is some disagreement about whether it is organic or inorganic. One recorder will write a list of the organic mulches in one column on the board, and the other recorder will make a column of the inorganic mulches.

Count the number of samples in each column.

Which column has the greater number of mulches?

Select a couple of organic and inorganic mulches from the samples. Ask the class how each of them is used as a mulch, i.e., vegetable garden, around trees, in the playground, etc.

Are these mulches more decorative or functional?

If layers of these mulches were placed on the soil surface, what would they have in common?
They would all help conserve soil moisture, prevent weed growth, and prevent erosion.

How does mulch keep weeds from growing?
It prevents sunlight from reaching the soil, making it difficult for weed seedlings to grow.

How does mulch conserve soil moisture?
It reduces the amount of water evaporation from the surface of the soil.

What are some advantages of organic mulches?
They look more natural, they will decompose, etc.
What are some disadvantages of organic mulches?
They decompose quickly and need to be replaced frequently.

What are some advantages of inorganic mulches such as river rock?
They are permanent and don’t need to be replaced.

What are some disadvantages of inorganic mulches?
They are heavy to haul. The soil can’t be worked up after they are in place, more expensive, etc.

Have two students hold up each mulch bag and have students discuss how they have seen them used in a landscape or garden or how they could be used.

Would the depth of the mulching material make a difference in how well it works?
Yes.

What would happen if you covered your vegetable plants or flowers with mulch?
They wouldn’t get any light, and they would die.

What and how is mulch building, recycling, and conserving?
Mulch is building the soil if it is organic and will decompose. It is recycling materials such as bark, grass clippings, etc. Mulch conserves soil moisture and reduces soil loss caused by wind and water erosion.

How would mulching be good for our garden?
Mulches conserve water in the soil by reducing evaporation. They also cover the soil and keep weeds from growing.

What mulching materials do you think we could easily find and use in our garden?
Grass clippings, pine needles, newspapers, etc.

“Mulch” More

Activity 5

Materials
- Mulching materials such as grass clippings, pine needles, sawdust, straw, black plastic mulch or garbage bags, etc. (Save grass clippings from mowing; however, do not store for more than a day in plastic garbage bags or they become a packed, smelly mess.)
- Garden gloves (several pairs – students can bring from home)
- Shovel
- Small buckets for spreading mulch

Contact your school maintenance workers to see if they can have a load of mulch dropped off at your school for this activity.

If your class is growing a garden, such as the sunflower house, butterfly garden, or salad garden, you may want to mulch around the plants. Collect grass clippings and other
mulching materials. Use the table below to determine the depth to apply the mulch. Black plastic garbage bags can be cut and laid around tomato, pepper, squash, pumpkin, or cucumber plants. Secure the edges of the plastic with soil to prevent it from blowing up with the wind.

Discuss the different types of mulches and the depth to apply them.

**Why are mulches applied at different depths?**
Because of the differences in thickness and the way they pack down over time – some become denser and more compact.

**As the season progresses, compare the effectiveness of the different mulches.**

**Is it still in place?**
**Did it prevent weed growth?**
**Did it have to be replenished?**
**When looking at the number of weeds and water needs of the plants, how did the mulches compare to bare soil?**

<table>
<thead>
<tr>
<th>Mulch</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dried grass clippings</td>
<td>3&quot;-4&quot;</td>
</tr>
<tr>
<td>Sawdust</td>
<td>1&quot;-2&quot; (available from lumber yards)</td>
</tr>
<tr>
<td>Straw</td>
<td>4&quot;-6&quot;</td>
</tr>
<tr>
<td>Black/white newspaper</td>
<td>6-8 sheets</td>
</tr>
<tr>
<td>Carpet samples</td>
<td></td>
</tr>
<tr>
<td>Black plastic</td>
<td></td>
</tr>
</tbody>
</table>

**RESOURCES**

Garden Mosaics, American Community Gardening Association and Cornell University, New York City [www.gardenmosaics.org](http://www.gardenmosaics.org)
Iowa State University Extension and Outreach, Growing in the Garden. [http://www.extension.iastate.edu/growinginthegarden](http://www.extension.iastate.edu/growinginthegarden)
Go to the Resource, Lessons and Activity Ideas
USDA FNS People’s Garden School Pilot Program: Healthy Gardens, Healthy Youth [www.peoplesgarden.wsu.edu](http://www.peoplesgarden.wsu.edu)

*Compost supply sources:
Planet Natural. [http://www.planetnatural.com/site/compost-thermometer.html](http://www.planetnatural.com/site/compost-thermometer.html)
Johnny’s Selected Seeds. [http://www.johnnyseeds.com](http://www.johnnyseeds.com)
Seeds of Change. [http://www.seedsofchange.com](http://www.seedsofchange.com)

*Inclusion does not imply endorsement.*
**Nutrition Lesson: Cabbage**

The following activities are from **Harvest of the Month: Cabbage**.

A. Page 2: Find fresh examples (if not available, find pictures) of the different types of cabbage in the chart under “Botanical Facts”. 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. You may want to wash and taste each of the types (see tasting sheet).
   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.

   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.

C. Page 2: Read the “what are cruciferous vegetables” and “Reasons to Eat Cabbage” page 1.
   1.) Have students make a list of cruciferous vegetables that they eat and those that they would like to try.
   2.) Review Reasons to Eat Cabbage and Fruit and Vegetable Nutrients from the student worksheets. What other nutrients to cruciferous vegetables contain?
   3.) What health benefits do cruciferous vegetables provide for our body?
   4.) Have students develop a list of snack suggestions that include cruciferous vegetables and share with classmates.

C. Page 4, “Science Investigation”: follow the steps listed to determine whether a substance is an acid.

D. Page 4, “Physical Activity Corner”: Teach students how to do Chinese jump rope, an activity that can improve kinesthetic movement and endurance. This is a great group activity, and may take some time to perfect. Set aside time each week to practice.

E. (optional). Consider reading a book with the students. Check with your librarian or the local library for a copy.

*The Cabbage Solution* by Erika Oller (Penguin Group, 2004) Overview: Elsie lives a simple life on a small farm, growing things that she sells to the green grocer, but one night half of her cabbages disappear and her cats, Fluff and Gordo, find the culprits and make them set things right.
Tiny Green Thumbs by C.Z. Guest (Hyperion Book, 2000)
In this how-to book in the guise of a story, Ganny Bun tutors her grandson, Tiny Bun, on the "six things you need to grow a garden." Brief horticultural discussions between them provide a background for gardening. The half dozen essentials, explained in accessible terms, are: preparing the soil; planting the seeds (e.g., place cucumber seeds in four mounds, "at least two feet from one another and about the size of home plate on a baseball field"); watering the seeds; sunshine; time (during which aspiring gardeners can cultivate the garden by weeding, etc.); and lastly, love. "If you [care for your garden] right, by the end of July, you'll be able to play hide-and-seek among the cornstalks," conclude the instructions.

What is a Plant? by Bobby Kalman (Crabtree Publishing, 2006) Overview: One in the "Science of Living Things" series, this book is filled with colorful drawings and photographs. Biology comes alive as the various aspects of plant life are discussed and illustrated. Defining plants, their importance on this earth, parts of plants, their systems of survival and the great variety are discussed sufficiently enough to inform and inspire, but not overwhelm an elementary age student.

These book offers the opportunity to review/discuss plants, gardens, growing foods on a farm and dealing with garden pest and predators.
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.

*Download labels from [www.harvestofthemonth.com](http://www.harvestofthemonth.com).

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)
- ½ teaspoon salt
- ½ 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, 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](http://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.


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

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Grows best at 50 to 75 F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>Sandy loam or raised clay soil beds; requires added compost and moisture</td>
</tr>
<tr>
<td>Exposure</td>
<td>Full sun or partial shade</td>
</tr>
<tr>
<td>Planting</td>
<td>Seedlings spaced 1 to 2 feet apart; rows spaced 2 to 3 feet apart</td>
</tr>
<tr>
<td>Days to maturity</td>
<td>50 to 90 days</td>
</tr>
<tr>
<td>Harvest period</td>
<td>Average two crops per year (winter and spring)</td>
</tr>
<tr>
<td>Harvesting</td>
<td>Hand-harvested and field packed</td>
</tr>
</tbody>
</table>


www.urbanext.uiuc.edu/veggies/cabbage1.html

Botanical Facts

Pronunciation: käb’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.

<table>
<thead>
<tr>
<th><em>B. oleracea</em> Cultivar Group</th>
<th>Includes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acephala</td>
<td>Kale, collard greens</td>
</tr>
<tr>
<td>Alboglabra</td>
<td>Kai-lan (Chinese broccoli)</td>
</tr>
<tr>
<td>Botrytis</td>
<td>Cauliflower</td>
</tr>
<tr>
<td>Capitata</td>
<td>Cabbage</td>
</tr>
<tr>
<td>Gemmifera</td>
<td>Brussels sprouts</td>
</tr>
<tr>
<td>Gongylodes</td>
<td>Kohlrabi</td>
</tr>
<tr>
<td>Italica</td>
<td>Broccoli</td>
</tr>
</tbody>
</table>

For more information, visit: http://plants.usda.gov

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>
</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.

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

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
www.cdfa.ca.gov

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.ers.usda.gov
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
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

School Garden: Heads of Cabbage
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.

Cabbage needs cool weather to grow. Whether cabbage is grown in the garden or purchased from the store, it is an important vegetable that can be eaten raw or cooked.

The cabbage family tends to be high in vitamins C and K and has many other ingredients that help the body fight disease. The outer leaves of the green and red cabbages tend to be a darker color than the newer, inside leaves where the light does not reach them.

Fresh cabbage heads from the garden have many open leaves that can be eaten. These are the first leaves that appear as the cabbage head develops. When cabbage is purchased at the store; the darker outer leaves that are not tight against the head have generally been removed so just the compact head is seen.

Activity: Investigating Cabbage
- Rinse and slice a cabbage lengthwise so the “tree” inside can be seen. (Hint: This is easier to see in red varieties.)
- Have each group look at their half and take turns peeling the layers off.
- Compare the textures and colors of inner and outer leaves.
- Taste the different layers and compare intensity of taste.
- Compare Nutrition Facts labels.

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
# Green Cabbage

## Nutrition Facts

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Value</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serving Size</td>
<td>½ cup cooked green cabbage, shredded (75g)</td>
<td></td>
</tr>
<tr>
<td>Calories</td>
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</tr>
<tr>
<td>Saturated Fat</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>0g</td>
<td>0%</td>
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<tr>
<td>Cholesterol</td>
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<tr>
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<tr>
<td>Sugars</td>
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<tr>
<td>Protein</td>
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<tr>
<td>Vitamin A</td>
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<tr>
<td>Calcium</td>
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<td>Iron</td>
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Other nutrients: Vitamin K (102%), Folate (6%)

NDB No: 11110

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<th>Grade 3 February Mulch/Cabbage Lesson</th>
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<tbody>
<tr>
<td>19</td>
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</table>
Green Cabbage

Nutrition Facts

Serving Size: ½ cup green cabbage, shredded (35g)

<table>
<thead>
<tr>
<th>Nutrition</th>
<th>Value</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Calories from Fat</td>
<td>0</td>
<td>0%</td>
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<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>
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<tr>
<td>Sodium</td>
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<tr>
<td>Total Carbohydrate</td>
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<tr>
<td>Dietary Fiber</td>
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<td>4%</td>
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<tr>
<td>Sugars</td>
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<tr>
<td>Protein</td>
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<td>Vitamin A</td>
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<tr>
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<td>Calcium</td>
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<td></td>
</tr>
<tr>
<td>Iron</td>
<td>1%</td>
<td></td>
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</tbody>
</table>

Other nutrients: Vitamin K (33%)

Source: www.nal.usda.gov/fnic/foodcomp/search/
NDB No: 11109
# Red Cabbage

## Nutrition Facts

<table>
<thead>
<tr>
<th>Serving Size: ½ cup cooked red cabbage, shredded (75g)</th>
<th>Calories 22</th>
<th>Calories from Fat 0</th>
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<tbody>
<tr>
<td>% Daily Value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Fat 0g</td>
<td>0%</td>
<td></td>
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<tr>
<td>Saturated Fat 0g</td>
<td>0%</td>
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<td>Trans Fat 0g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholesterol 0mg</td>
<td>0%</td>
<td></td>
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<tr>
<td>Sodium 21mg</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Total Carbohydrate 5g</td>
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<tr>
<td>Dietary Fiber 2g</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Sugars 2g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein 1g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin A 1%</td>
<td></td>
<td>Calcium 3%</td>
</tr>
<tr>
<td>Vitamin C 43%</td>
<td></td>
<td>Iron 3%</td>
</tr>
</tbody>
</table>

Other nutrients: Vitamin K (45%), Vitamin B6 (8%), Potassium (6%), Folate (5%)

NDB No: 11113
Red Cabbage

**Nutrition Facts**

<table>
<thead>
<tr>
<th>Serving Size: ½ cup red cabbage, shredded (35g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories 11</td>
</tr>
<tr>
<td>% Daily Value</td>
</tr>
<tr>
<td>Total Fat 0g</td>
</tr>
<tr>
<td>Saturated Fat 0g</td>
</tr>
<tr>
<td>Trans Fat 0g</td>
</tr>
<tr>
<td>Cholesterol 0mg</td>
</tr>
<tr>
<td>Sodium 9mg</td>
</tr>
<tr>
<td>Total Carbohydrate 3g</td>
</tr>
<tr>
<td>Dietary Fiber 1g</td>
</tr>
<tr>
<td>Sugars 1g</td>
</tr>
<tr>
<td>Protein 1g</td>
</tr>
<tr>
<td>Vitamin A 8%</td>
</tr>
<tr>
<td>Vitamin C 33%</td>
</tr>
</tbody>
</table>

Other nutrients: Vitamin K (17%)

NDB No: 11112
What do cabbage, broccoli, bok choy, and cauliflower have in common?

They are all members of the **cruciferous** family of vegetables. Cruciferous vegetables have flowers that form the shape of a cross. The word “cruciferous” comes from the word cross, or *crucifer*.

Look at the list on the left. Which of these cruciferous vegetables have you eaten?

- cabbage
- broccoli
- bok choy
- cauliflower
- rutabagas
- kale
- radish
- turnips
- watercress
- collared greens
- mustard greens
- arugula

Which of these cruciferous vegetables would you like to try?

Phytochemicals

One of the most important reasons to eat cruciferous vegetables is for the phytochemicals they contain. **Phytochemicals are found in fruits, vegetables, and other plants.** Phytochemicals are the natural parts of fruits and vegetables that give them deep, dark colors, and in some cases, strong odors.

An easy way to remember how to say phytochemicals is “fight-o-chemicals”. Phytochemicals help protect plants from bugs or insects and sun damage. They also protect our body and may be strong disease fighters—or “phyters”—by helping to **fight cancer, heart disease, and diabetes**. There are over 4,000 different phytochemicals!
Fruit & Vegetable Nutrients

Fruits and vegetables come in many different colors. Colorful fruits and vegetables contain different nutrients. Nutrients are all of the good things inside of food that our body needs to be healthy and strong. Eating a variety of colorful produce helps us get all the nutrients our bodies need.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>What it does</th>
<th>Where it’s found</th>
</tr>
</thead>
</table>
| vitamin A | • helps keep your skin healthy  
• important for helping you to see at night | cantaloupe, carrots, sweet potatoes, spinach, and broccoli |
| vitamin C | • important for keeping your gums and skin in good shape  
• helps your body to heal if you get a cut | cabbage, kiwi, oranges, red bell peppers, and strawberries |
| calcium  | • most important mineral for bone health  
• makes your bones and teeth strong and healthy | green leafy vegetables, such as broccoli |
| iron     | • helps to carry oxygen from your lungs to the rest of your body | potatoes, spinach, and broccoli |
| fiber    | • helps keep your digestive system healthy  
• may help lower cholesterol | all fruits and vegetables |

**Test your knowledge!**

Why is it important to eat a variety of fruits and vegetables? ____________________________________________

___________________________________________________________________________________________

What does fiber do for your body? ____________________________________________

___________________________________________________________________________________________

For important nutrition information visit [www.cachampionsforchange.net](http://www.cachampionsforchange.net). For food stamp information, call 877-847-3663. Funded by the USDA Supplemental Nutrition Assistance Program, an equal opportunity provider and employer.
Vegetables are fun and easy to eat! Check out these tasty ideas.
It’s simple to add vegetables to your meal!

Add different colored veggies to your pizza like purple onions, bell peppers, and tomatoes!

Eat a salad with your pizza. You can add colorful veggies and fruits to add taste and color!

Sprinkle some low-fat cheese on your favorite veggies (like broccoli, carrot sticks, or cauliflower), then melt it in the microwave for a quick, healthy snack!

Add some broccoli, zucchini, and bell peppers to your pasta. They are yummy and colorful!

Make a list of meal ideas that you would like to make at home. Include at least one of your favorite vegetables.

Setting SMART goals
Write down one thing you will do to try to eat more fruits and vegetables (e.g. “I will add extra lettuce and tomato to my burger at lunch tomorrow.”)

For important nutrition information visit www.cachampionsforchange.net. For food stamp information, call 877-847-3663. Funded by the USDA Supplemental Nutrition Assistance Program, an equal opportunity provider and employer.
Cabbage Taste Test

Directions: Write in an adjective that describes the taste, smell, color, and texture.

<table>
<thead>
<tr>
<th></th>
<th>Taste</th>
<th>Smell</th>
<th>Color</th>
<th>Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Cabbage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purple Cabbage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>What do I already know about Cabbage?</th>
<th>What do I want to learn about Cabbage?</th>
<th>What did I learn about Cabbage?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

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 in Tulare County, call 1-800-834-7121. This material was created and approved as an extension to the Harvest of the Month developed by the Network for a Healthy California.

Grade 3 February Mulch/Cabbage Lesson