Gardening for nutrition

Florida Agriculture in the Classroom, Inc.

A comprehensive guide for Florida educators designed to teach health, science, language arts, math and more using a school garden.

Florida Agriculture in the Classroom, Inc
AGRICULTURE KEEPS FLORIDA GREEN

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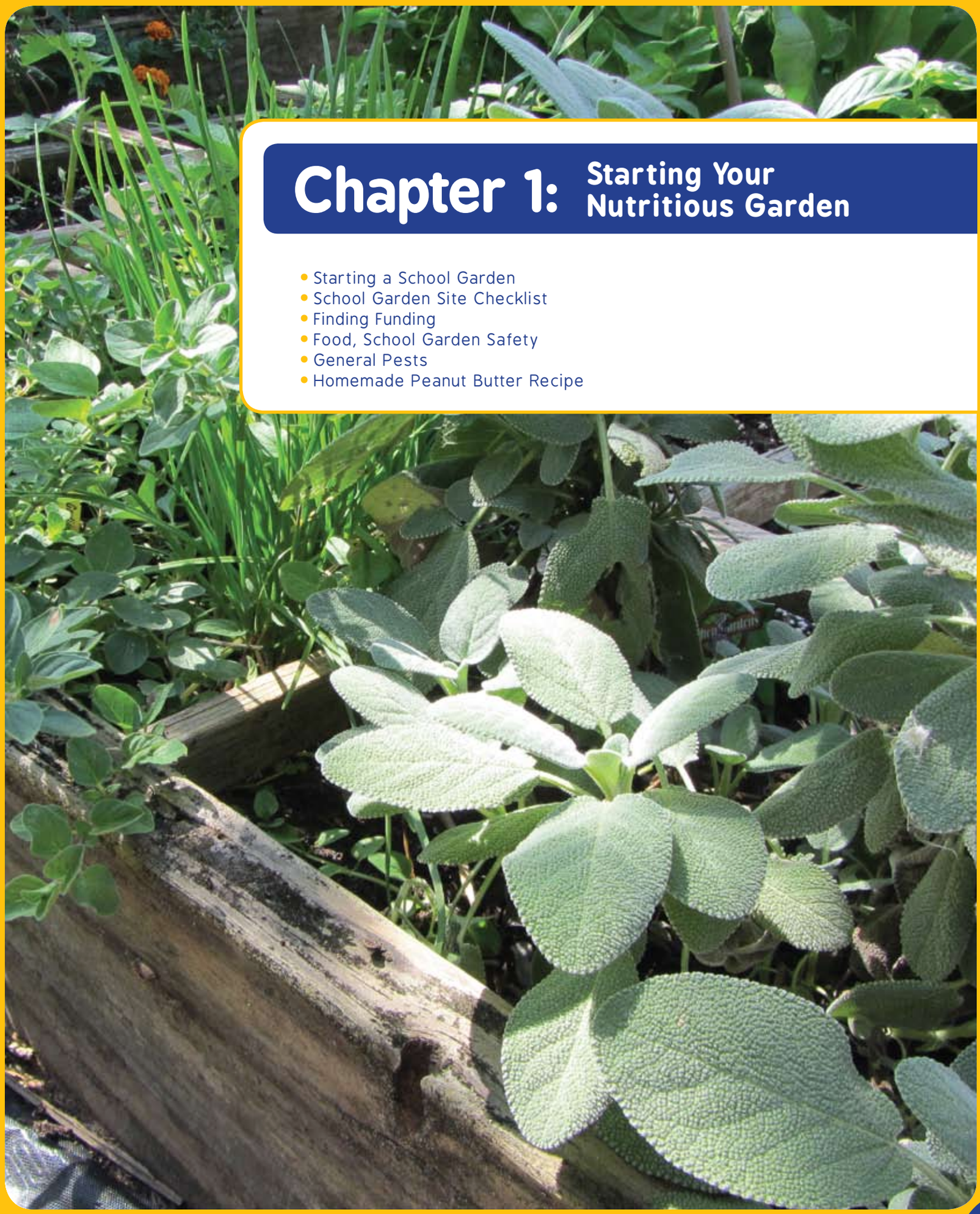


Chapter 1: Starting Your Nutritious Garden

- Starting a School Garden
- School Garden Site Checklist
- Finding Funding
- Food, School Garden Safety
- General Pests
- Homemade Peanut Butter Recipe

Starting a School Garden

Florida teachers are helping students build gardens of all shapes and sizes in their classrooms and schoolyards. Whether they grow herbs in a sunny windowsill, a butterfly garden in containers along the hallway or beds of vegetables and sensory garden plants on the school grounds, a school garden allows students to apply their standards-based education in unique, innovative and engaging ways.

Every grade can discover a component of gardening that correlates with curriculum from observing plants grown from seed, to measuring the growth of plants, to designing experiments, to growing plants from historic novels, to creating a school market with the vegetables or flowers they've grown. This guide helps teachers discover applications of school gardens within their own classrooms and schoolyards and gives them techniques and resources to help grow successful gardens.

Florida is unlike any other state in its climate and growing conditions. Many other school gardening guides are written for a broader geographic region and thus suggest plants that cannot take Florida's heat and humidity. Unlike northern and western regions of the United States, Florida has two growing seasons that are ideal for supporting school gardens: The cool season begins as school starts and the warm season begins in early spring. This guide addresses Florida's unique gardening cycles and gives Florida teachers a comprehensive guide to helping plants thrive in the Sunshine State.

Research has shown that gardening in school positively influences students' attitudes about the environment, school and nutrition, self esteem, test scores, interpersonal skills and behavior. For example, students in third and fifth grade classrooms who learned science through gardening scored higher than classrooms that did not use the garden (National Gardening Association, 2002). A summary of National Gardening Association grant evaluations from 253 teachers across the country confirmed that their school gardens improved students' self confidence, leadership abilities and attitudes about the environment and school, among other attributes (National Gardening Association, 2009).

In Florida, student achievement scores have improved after implementing gardening programs that reinforce important standardized test and end-of-the-year exam concepts. Overall, school gardens improve academic achievement, healthy lifestyles, environmental stewardship and social development (California School Garden Network, 2006).

Florida Agriculture in the Classroom, Inc.'s *Gardening for Grades* and *Gardening for Nutrition* school garden curricula were designed to help teachers educate students about the importance of Florida agriculture and the benefits of growing and eating a variety of fresh fruits and vegetables. After all, Florida produces more fresh fruits and vegetables than any other state in the country except California!

School Garden Site Checklist

Use this checklist to help determine what resources are available to create the garden.

1. Sun

- ☐ Plants make food from sunlight and plants have adapted to "need" a certain amount of light to grow. Indoor plants can thrive with very low light levels, but most vegetables, fruit, herbs and flowers need 6-8 hours of full sun to grow properly (typically between 9 a.m. and 4 p.m.). Gardening under trees, or in the shade of trees and buildings can be done with certain types of plants. Teachers should consult a master gardener or extension agent in their county for details about the types of plants that can grow in shady areas. Contact information for county Extension Offices and Farm Bureau Offices is located on pages 228-231. Seed catalogs and packages likely also provide this information.

- ☐ The sun's position moves from spring to summer to fall to winter. An area that's in full sun one season, but surrounded by tall trees or buildings, may not have full sun the rest of the year. If the schoolyard is large enough, try to choose an area that is free from trees and away from buildings to minimize the chances of this happening. In Florida, vegetables grow best on the south side of a site and in rows running north to south.

- ☐ Use the expertise of your schoolyard caretakers – they may know whether an area remains sunny year round!

2. Water

- ☐ Every type of garden will need easy access to water. Once you've found a sunny site, determine:
  - ☐ Are there water spigots outside, near the site? If not, can they be installed?
  - ☐ It will be tedious to bring water from the classroom out to water plants. If classroom water is all that's available, think of creating small container gardens right outside the classroom.

- ☐ Look for community partners to design the plan and install the irrigation.

- ☐ If an automatic system is not possible, students can use the "cup of water" method, and dip a margarine tub (or other cup-sized container) in a bucket to individually water plants, or use a watering can. If using a hose to water, be sure to purchase a water wand, adjustable nozzle or other ways to soften the flow of water from the hose.

3. Space

- ☐ What space is available to garden?
  - ☐ Be creative. Look for raised planters around walkways, courtyard areas and larger pieces of unused land.
    - ☐ Be sure the space is not used by another classroom already. If it is, check with other teachers to reach a compromise about site usage.
  - ☐ If space is tight, container gardening may be a good solution.
  - ☐ Consideration should be made to allow all students equal access. For example, beds raised high enough will enable children in wheelchairs the same access as those not in wheelchairs.

- ☐ How many classes will be using the garden?
  - ☐ Ideally, each child would grow his or her own plant. An entire grade growing beans will need 4 inches of row per child, for example — 80 students will need two 14-foot-long rows of space for their bean seedlings. Hydroponics gardening allows plants to be grown vertically, maximizing space, but is limited as to the kinds of plants that thrive in these systems. See the hydroponics growing section on page 19, in Chapter 2, for more information.

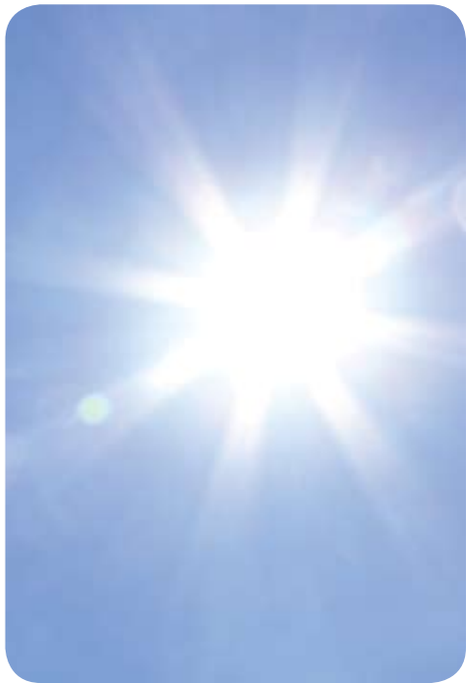
4. Time

- ☐ Planning
  - ☐ Which teachers and staff may want to assist in planning the garden?
  - ☐ When will you create your garden plan and curriculum? (Most school gardens are planned in the summer and started in the fall season, to maximize growing during the school year.)
  - ☐ How will you ensure that support staff and administration are involved in the plan?

- ☐ Budgeting
  - ☐ List some local business and parent partners who could assist in gathering the supplies and expertise needed (garden centers, botanical gardens, irrigation and landscape companies, among others).
  - ☐ Who will be in charge of gathering current and future funds?

- ☐ Creating
  - ☐ Will the garden be created by parent volunteers, teachers, students, or all three?
  - ☐ Are there volunteer organizations that can assist with the workday?

- ☐ Maintaining
  - ☐ How will the watering schedule, if needed, be decided? A sign-up sheet for each weekend of the school year is helpful.
  - ☐ When will the garden be weeded?
  - ☐ Who will maintain the garden over the summer? Many schools plant a cover crop, or a hot-weather crop like Boniato Cuban sweet potato.



Finding Funding

Many programs exist, both national and statewide, that provide funding for school gardens. Before searching for funding, make sure that a clear vision and plan is in place.

Many schools have had success with local or statewide sources of funding, depending on the size and scope of the project. Successful funding proposals build on the outline given for administrators and include realistic goals and timeframes. Before applying, be sure to research the grant program and make sure the garden fits the funder's priorities and that their resources meet the school's needs. A partial list of funding sources includes:

Local

Florida Agriculture in the Classroom: Funded by the 'Ag Tag,' Florida Agriculture in the Classroom offers volunteer grants and teacher grants to assist teachers in building schoolyard gardens. Both programs strive to fund projects that teach Florida students about the importance of agriculture and introduce them to agricultural producers and representatives in their areas.

Florida Agriculture in the Classroom Volunteer Grants

Timeline

Proposals due in March, winners selected in April or May, all funds spent by June of the following year.

Eligible Applicants

Agricultural non-profit organizations based in Florida that are interested in educating Florida students about Florida agriculture.

Grant Requirements

- Must have direct contact with Florida students in pre-kindergarten through 12th grade.
- Must expand an existing program or create a new program (Not to replace existing funding).
- Must include either monetary or in-kind matching contributions.
- Use of Florida Agriculture in the Classroom curricula and/or materials is encouraged and should be mentioned in the application and in the final report.
- Must include involvement of at least one local farmer or agriculture industry representative as a speaker or project helper.
- Must give students participating in the grant project pre- and post-tests, and include the results of these tests in the final report.
- Because of food safety concerns, compost and/or animal waste can not be used on edible plants.

Funding Guidelines

- Grants will be awarded in amounts up to $2,500.
- Grant projects awarded $1,000 or more may re-apply up to three times consecutively.
- Grant money cannot be used for transportation.
- Grant money cannot be used for consumables unless the food items are an integral part of the lesson plan and the end product.
- Grant checks will be made payable to an organization, not an individual.
- Grant checks not cashed within 60 days after receipt will become null and void.

Funding Links At-a-Glance

Florida Agriculture in the Classroom
www.faitc.org

Dairy Council of Florida
www.fueluptoplay60.floridamilk.com

Florida Association of Science Teachers
www.fastscience.org

Florida School Garden Competition
www.gardeningsolutions.ifas.ufl.edu

Florida Farm Bureau Federation
www.floridafarmbureau.org

Florida Nursery, Growers and Landscape Association
www.fngla.org

Lowes
www.toolboxforeducation.com

National Gardening Association
www.kidsgardening.org

National Science Teaching Awards
www.nsta.org

Sea World/Busch Gardens
www.seaworld.org

- Half the money is paid up front. The other half is paid when the Final Report is submitted.

Florida Agriculture in the Classroom Teacher Grants

Timeline

Grants due in October; final report due in April.

Eligible Applicants

Certified general education and agri-science teachers in Florida who integrate agricultural concepts into non-agricultural curricula.

A basic budget for a school garden includes the following considerations:

- ❑ Plants
- ❑ Curricula and resources
- ❑ Watering supplies
- ❑ Tools
- ❑ Fertilizer
- ❑ Mulch or 6 sheets of newspaper with a layer of straw over top works well to keep weeds in control
- ❑ Peat moss to hold moisture in soil
- ❑ Perlite (to create space for oxygen in soil and helps excess water drain out of soil)
- ❑ Recycled plastic decking, untreated lumber or concrete blocks for garden beds
- ❑ Additional discretionary funds to help pay for unforeseen costs

Grant Requirements

- Must use agricultural concepts and directly involve students.
- Must incorporate Florida Agriculture in the Classroom curricula and materials.
- At least one farmer or agricultural industry representative must be involved in the project.
- Teachers must administer pre- and post-tests, and include results in the report.
- Community involvement, including a list of in-kind donations, is encouraged.
- A detailed budget spreadsheet must be included in the application.
- Because of food safety concerns, compost and/or animal waste can not be used on edible plants.
- For more information, visit www.faitc.org

Florida Association of Science Teachers (FAST)

- FAST Mini Grants

  Open to FAST members or certified Florida teachers for projects that involve inquiring or hands-on science. Up to $500 available. Deadline is in September.
- For more information, visit www.fastscience.org

Florida School Garden Competition

Open to all Florida elementary schools (public, private and home). Grants are distributed to single class gardens, multiple class gardens and entire school gardens. For more information, visit www.gardeningsolutions.ifas.ufl.edu

National FFA Organization (formerly known as Future Farmers of America)

- Living to Serve Program Grants and Awards

  Focused on rural communities to develop, implement and evaluate community-based projects that meet an identified community need, using skills agricultural students are learning in their classroom. Up to $2,000 each given to an FFA chapter.
- Partners in Active Learning Support Program

  Matches high school and elementary school students in a mentoring program focusing on a community-based service project. Up to $1,000 each given to an FFA chapter.
- For more information, visit www.ffa.org

Dairy Council of Florida

- Dairy Council of Florida offers Fuel Up to Play 60 grants for school, part of the proceeds of which can be spent on school gardens.
- For more information, visit www.fueluptoplay60.floridamilk.com

Florida Farm Bureau Federation

- Mini grants of up to $250 for all pre-K - 12 Florida teachers.
- For more information, visit www.floridafarmbureau.org

Florida Nursery, Growers and Landscape Association (FNGLA)

- Arbor Day – free tree vouchers to select 4th grade classes. For more information, visit www.fngla.org

Possible cash, materials or service donations:

- Local Chamber of Commerce
- Local community Partners in Education
- Local garden clubs
- Local service clubs (Rotary, Elks, Jaycees, Kiwanis, etc.)
- Local club chapters (Sierra Club, Florida Native Plant Society, etc.)
- Local home supply stores
- Soil and water conservation districts

National

Lowes: Toolbox for Education Awards

Open to all schools, nationwide. Grants of up to $5,000 are available per school. Preference is given to schools in underserved areas. Completed within a year of receiving funding.

For more information, visit www.toolboxforeducation.com

National Gardening Association: Youth Garden Grants

Schools, youth groups, community centers, camps, clubs and intergenerational groups in the United States, working with at least 15 children ages 3-to-18. Programs that emphasize integration into the curriculum, nutrition connections, environmental awareness, entrepreneurship or social development related to gardening will be given priority. Required to submit an impact report. Several grants available, ranging from $250-$1,000. Grants are due in November.

For more information, visit www.kidsgardening.org

This site also contains links to a host of other gardening grant opportunities.

DuPont National Science Teaching Awards

- DuPont Pioneer Excellence in Agricultural Science Education Award

  This award will recognize and honor excellence and innovation in the field of agricultural science education. One award given annually to a K - 12 science teacher. Winners will receive a $5,000 grant for their classroom, paid travel to the NSTA national conference, mentoring with a DuPont scientist, classroom resources and access to a DuPont Pioneer research facility.

  For more information, visit www.nsta.org/about/awards

- Teachers may be eligible for other awards. For more information, visit www.nsta.org

Food, School Garden Safety

Garden Preparation:

Soil should be tested for contaminants before planting, especially if the school garden is near parking areas or other high-traffic zones. Consider purchasing soil meant for food production from an established retail entity to ensure soil safety and traceability. Water for irrigation needs to be potable and from a tested source. Soil and water testing kits are available through extension offices in each county. For local information, please see Chapter 10 beginning on page 228. Building materials for garden beds, containers, stakes or trellises should be constructed of non-toxic, non-leaching material (no pressure treated wood or used tires).

Growing Practices:

Consider the source when buying seeds for a school garden.

- Look for quality, certified pest-free seed that come from companies that have taken a "safe seed pledge."
- Adults should use natural and synthetic crop-protection chemicals cautiously and in accordance with label wording. The same is true of natural and synthetic fertilizers. Any crop protection chemical will indicate the use limitations and required pre-harvest intervals.
- Coordinate with school groundskeeping or custodial staff about school garden goals, protocols and maintenance plan, especially concerns about the presence of lawn or school crop-protection chemicals on or near the garden.

Harvesting and Handling:

Students, staff, parents or volunteers involved in harvesting should wash hands thoroughly in warm soapy water for at least 20 seconds before harvesting. Anyone with open cuts or wounds on their extremities, who has been sick or "under the weather" in any other way, should not participate in harvest until they have healed or recovered. All harvesting tools (scissors, bowls, tubs) should be food grade and/or food service approved and designated solely for harvest and food handling. The tools should be cleaned regularly with hot water, soap and sanitizing solution and then dried. School garden produce delivered for use in a school cafeteria should be received by food service personnel upon delivery with the same system used to receive and inspect all other incoming products. If storage is necessary, produce should be cooled and refrigerated promptly after harvest. Temperatures vary on type of produce being harvested. School garden produce should be washed according to the standards in place for conventionally received produce. Cafeteria staff should supervise students, parents, or staff who participate in any food preparation, taste-testings or special cafeteria events.

Storing Food Safety Tips:

The best defense against food borne illness is cleaning and sanitizing the breeding ground that spreads the harmful toxins: hands, work and eating surfaces, utensils, towels, dishcloths, sponges and appliances.

- Store all foods in wrapped or covered containers.

- Store food quickly, do not leave at room temperature for longer than two hours.
- Thaw foods in the refrigerator, not on the counter.
- Cool leftovers and food cooked for later use in the refrigerator, not on the counter.
- Refrigerate perishable fruits and vegetables such as berries, lettuce, mushrooms and herbs.
- Washing before storing can promote bacteria growth and speed spoilage if still wet.
- For specific fresh fruits and vegetables, go to the Produce for Better Health Foundation website www.fruitsandveggiesmorematters.org
- Remember, some foods don't freeze well, quality is affected.

Other Considerations and Recommendations:

Review school district rules and regulations. Some plants that can cause serious allergic reactions (peanuts) may be prohibited. There may also be limitations on other plants (such as cotton) due to federal insect control programs (boll weevil eradication) or invasive species restrictions. Align a school garden program with any relevant school district wellness policies, school procedures for receiving gifts and donations, working with parent and community volunteers, and district liability policies. Safe handling information should be provided to anyone involved in the growing, harvesting, and preparation of foods from a school garden. Consider using your school garden as an educational tool to teach students about food safety procedures and incorporate curricula that teach these issues in your garden educational plan. The best practices outlined in this guide are intended to serve as a framework and may be easily adapted to meet individual school settings and regional requirements.

General Pests

Small, winding, yellowed lines in the leaves: Leaf miners. Common in bean, pea, celery, carrot, broccoli, cauliflower, cabbage, okra, potato and tomato plants. Plants can persist, and even thrive, with leaf miner damage. For severe leaf damage, gently remove the leaf and discard before fungus has a chance to enter into the plant and do more damage.


Leaf Miner

Spots on leaves: Caused by fungus, bacteria, viruses or mold from the soil. Spots that are round or oval are caused by fungus on the leaves. Spots caused by bacteria are irregularly shaped, and common on beans, cabbage, cauliflower, broccoli, peppers and tomatoes. Leaves that are covered with white powder may have powdery mildew. A natural deterrent is to use mulch, such as straw, to cover the soil and prevent transmission of diseases.


Aphid

Plant sliced off at the ground: Cutworms. Cutworms are found within a half an inch of the soil. They feed during the night, eating one plant per night, then sleep during the day near the plant that was eaten. To find them, take a pencil and inspect in concentric circles around the plant that was eaten until the worm is visible. Remove it. To stop them, encircle each stem of a new seedling with a toilet paper tube, nestled a half inch into the soil (be careful not to block the sun off the seedling).

Bugs we can see:
Aphids — tiny green, brown, yellow, pink or black bugs gathered on stems and under leaves. Aphids suck the sap from the plant, which harms the health of the plant. Ladybug larvae (2-3 milimeter black and orange worms with spikes) are good to see on a plant attacked by aphids. Ladybugs eat aphids and may clear up the problem by themselves. Otherwise, spraying rapidly with a hose can wash them off.


Slug

Slugs — pick off and drown in saltwater when seen. To trap, cut the top off a soda bottle and invert it back into the bottle with the opening facing into the bottle, then staple the edges in place. Place a small amount of stale, non-alcoholic beer in the middle. Slugs will be attracted to it and will drown.

Cut worms, caterpillars, beetles — pick off, or use a natural insecticide spray with Bt (Bacillus thurigiensis, a bacteria that harms worms but is safe for children and adults) on leaves of plants where worms are spotted.


Cutworm

Fruit is dark in one spot: Blossom end rot. Caused by a soil calcium deficiency or by irregular watering.

Homemade Peanut Butter

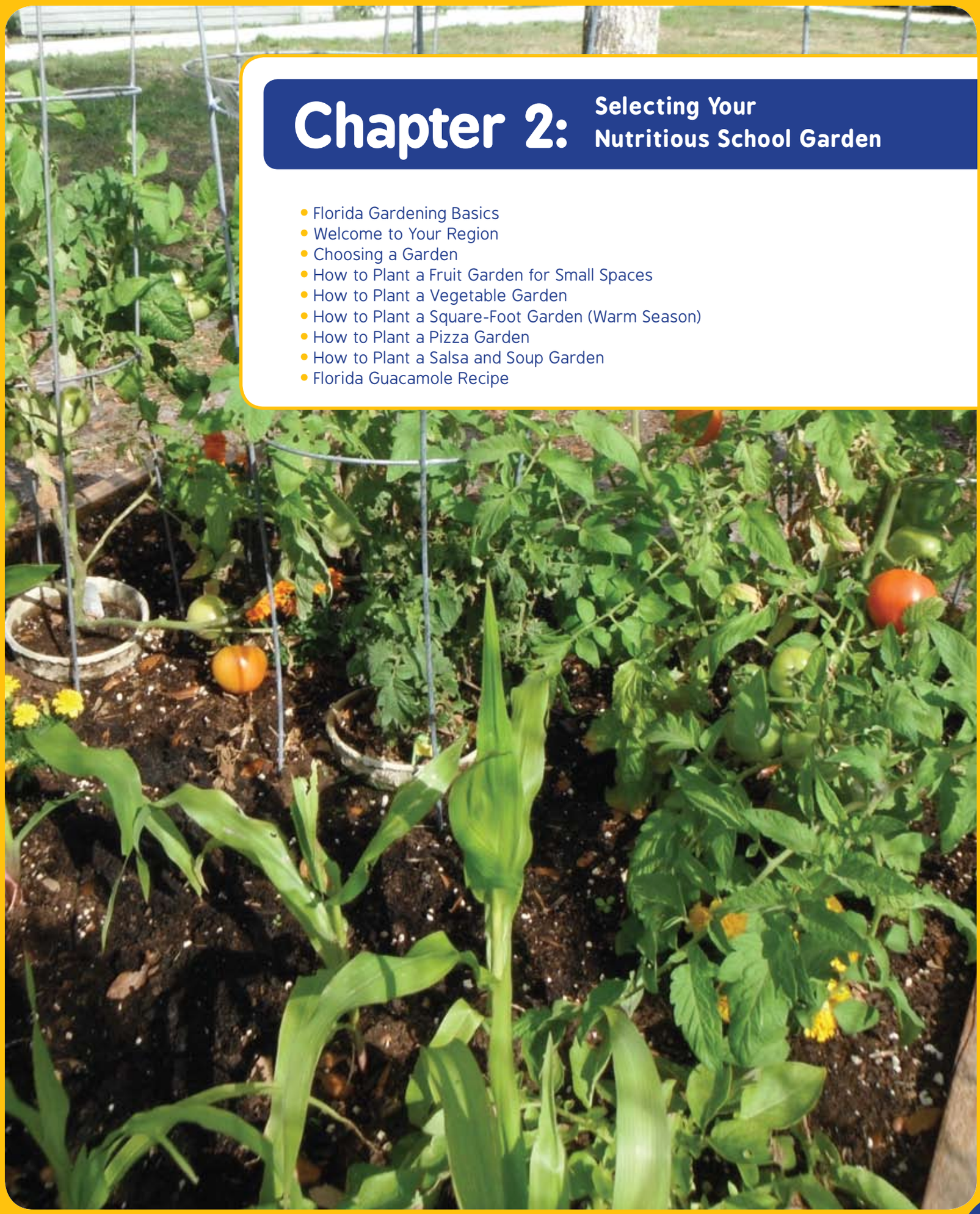
Try This Florida Recipe

Ingredients

- 2 cups dry roasted Florida peanuts
- 1 teaspoon salt (less for salted peanuts, more for unsalted)

Instructions

- Wash your hands with soap and water, gather all your kitchen gear and ingredients and put them on a clean counter.
- Put the peanuts into a food processor and process about one minute until they break down and bunch up into a glob.
- Stop the food processor and scrape around the inside of the bowl with a rubber spatula. Add the salt and continue to process, stopping two or three times to scrape the bowl, until the peanut butter is smooth, about one minute longer.
- Use a spoon to taste the peanut butter. If you like it saltier, add a pinch of salt and turn on the food processor for 3 more seconds to mix in the salt.
- Use the spatula to scrape the peanut butter into container with tight-fitting lid. Cover and refrigerate up to 2 weeks. When you take the peanut butter out of the fridge, it will be a little bit hard and difficult to spread, but it will soften after a few minutes on the counter.



Chapter 2: Selecting Your Nutritious School Garden

- Florida Gardening Basics
- Welcome to Your Region
- Choosing a Garden
- How to Plant a Fruit Garden for Small Spaces
- How to Plant a Vegetable Garden
- How to Plant a Square-Foot Garden (Warm Season)
- How to Plant a Pizza Garden
- How to Plant a Salsa and Soup Garden
- Florida Guacamole Recipe

Florida Gardening Basics

Completing the site inventory checklist (page 9 in Chapter 1) will give an idea of what resources are available. School gardens can thrive in a container along a walkway (or even in the classroom), in boxes or rectangles of wood on the school grounds (raised bed gardening), planted in traditional rows directly into the ground, or even grown hydroponically. The key is choosing the right plan and plants for the resources available; know what plant characteristics facilitate a variety of growing techniques; or limit the growing variations used.

Container Gardening Basics

Many vegetables, herbs and flowers can be grown in containers, providing spacing rules are followed and adequate fertilizer is applied. Importantly, a good potting mix should be purchased and used in the container – this provides the correct air and organic matter mixture plants need. Fertilize container plants more often, as they have less access to nutrients in their confined space. Here are some suggestions for inexpensive containers and the types of plants that can be adapted to that container size (Stephens, 1999):

- Pots, cans, milk jugs: chives, green onions, herbs, radishes, parsley and lettuce; pierce bottom for drainage
- Concrete blocks: bush beans (two-to-three plants in each section), parsley, herbs, lettuce
- Large, black plastic bags: tomatoes
- Bushel baskets, five-gallon trash cans: tomatoes, eggplants, peppers, pumpkins, cucumbers, cantaloupes and smaller vegetables
- Foodgrade barrels: strawberries (Set strawberries in holes along sides of barrel and in top)

Herbs, strawberries, squash and other vegetables can be grown in traditional window box or terra cotta containers — specific vegetables are included at the end of this book. Pre-fabricated systems such as EarthBox and GrowLab are available for purchase. EarthBox containers are used in many schools, which is is a modified system that closely resembles a hydroponics system. Peat moss, not soil, is used to keep plants in place, a plastic sheet covers the peat moss around the plants, and a fertilizer strip (it is recommended to put fertilizer in a nylon stocking to keep it in a strip) provides nutrients. Water

Tools for a School Garden

A variety of tools are used in gardening. Tools should be cleaned after every use and stored in a dry location.

Basic Tools

- Small trowels
- Student and adult-sized gloves
- Spades (pointed-edge shovel for digging holes, removing grass, turning soil)
- Flat-edge shovels (for moving dirt)
- Wheelbarrow
- Tape measure
- Large garden stakes and twine for making straight rows, tomato trellises
- Hammer (to pound stakes in)
- Fertilizer
- Lime or sulphur (to alter pH if needed)
- Drill
- Screws
- Recycled plastic lumber
- 18-inch stakes
- Wheelbarrow
- Hose
- Water wand

Learning

Labels to show what was planted (paint stirrers work well)
Grease pencil to write plant names
Hand pruners to harvest vegetables

Weed control

Straw (Do not use hay. Hay may add seeds that will introduce additional weeds.)
Mulch
Newspaper

Watering

Hoses with water wands (by hand)
Sprinklers on a timer (automatic)

Harvesting

Pitchfork
Handheld clippers (for trimming leaves, snipping fruit)
Sharp knife (for cutting the base of cabbage, etc.)

is added in a reservoir at the bottom, and an automatic watering system is available for purchase – keeping the reservoir full means the system is never over-watered. Private industry has many products. Choose the product best suited for your needs.

Hydroponics How-To

The term 'hydroponics' comes from the combination of the Greek word "hydro" (water) with "ponos" (labor)...i.e., "working water." Different cultures have used hydroponics for thousands of years, from the hanging gardens of Babylon to the floating gardens of the Aztecs. Scientists in the U.S. began experimenting with growing plants without soil in the 1920s. By 2004, over 55,000 acres of hydroponics greenhouses worldwide produced vegetables, and 68 percent of these produced tomatoes (Jones, 2005).

Plants need support, nutrients, water, light, carbon dioxide and oxygen to grow. Soil is useful to plants by providing support for their roots (which holds the plant in place), providing space for oxygen (the small spaces between soil particles allow roots to absorb small amounts of oxygen that they need) and by holding the nutrients (minerals and water) that the plant needs to grow. Plants can survive without soil if they have their needs taken care of in other ways. With a hydroponics growing system, a nutrient solution is flushed through the roots, the plant is supported by structures or inert growing media (such as sand or rocks) and oxygen is provided by the growing media or aerators in the nutrient solution.

Hydroponics growing is an advantage in areas where the soil can't grow plants, where labor is short or land is expensive. Ms. Deb Wagner, whose Environmental Club operates a hydroponics system at St Paul Lutheran School in Lakeland, likes hydroponics gardening because "it allows each student to grow their own plant — we can fit 30 strawberry plants in one vertical, hanging planter. I also don't have to come in to the school on the weekends to water the plants. They water themselves." Teachers interested in starting a hydroponics system are encouraged to find a local hydroponics grower and supplier who can help guide the setup and maintenance of the system.

Plants

Certain vegetables are grown hydroponically because insect problems and nutrition needs can be controlled, and the value of the crop exceeds the expense. The most common vegetable crops grown hydroponically are tomatoes, cucumbers, peppers, lettuce, strawberries and herbs. Seeds can be started in rock-

wool, then transplanted into pearlite or other growing media. Plants should get eight hours of sun each day. Most systems use greenhouses to control heat and light and to deter pests. Most plants grow best between 75 and 85 degrees Fahrenheit.

Types of Systems

Water cultures include wick, air-gap, raft, nutrient film techniques and aeroponics. Media cultures include top feed or flood-and-drain with pearlite, vermiculite, peat, sand, gravel, foams, pumice, among others.

A common hydroponics system in use in many schools is a column of interlocking styrofoam pots. Plants, usually strawberries, lettuce or herbs, are placed in four corners of each pot. Perlite is the inorganic plant support medium, and the nutrient solution is added at the top of the column, then drips down. This is an open system, which passes nutrient solution through the roots and then discards it.

A closed system collects the nutrient solution for re-use. A simple closed system to grow tomatoes uses one- and two-liter soda bottles filled with perlite; linking an identical bottle filled with nutrient solution to the soda bottle maintains one inch of growing solution at the base of the bottle.

Nutrient Solution

Plants need 17 elements to grow — carbon, hydrogen and oxygen (which they absorb from the air), sulphur, nitrogen, potassium, phosphorus, calcium, magnesium, boron, chlorine, copper, iron, manganese, molybendum, nickel and zinc. Each crop has a different nutrient requirement. Hydroponics growers make special nutrient solutions with the exact concentrations of the exact types of each of these elements. When growing plants hydroponically, it is very important to follow the directions on the nutrient solution exactly, as this will ensure that the nutrients needed for specific plants to grow are available.

Growing Medium

Commercial growers use perlite or rockwool, peat moss and pine bark to keep plants in place. Instruct students to examine large plantings in shopping malls or upscale hotels. Many of these are raised hydroponically and use pine bark. Volcanic rock or river rock is used as an anchoring material.

Raised Bed Gardening Basics

A raised bed garden is built from wood or plastic boards, typically four feet wide and as long as desired (four feet-by-four feet for square foot gardening, up to 14 feet long for rectangular beds). Because much of Florida soil is sandy and does not hold many nutrients, the deeper the garden beds, the better the soil will be. Many schools stack two boards on top of one another to achieve a 10-to-12-inch high garden bed, using 18-inch wooden stakes to keep the boards together. Potting mix or garden sand from the site itself are added to fill the boxes, leaving two inches from the top as clearance. Raised beds help prevent students from walking on delicate plant roots, clearly mark the boundaries of the bed and reduce some soil-borne pest problems. Schools in urban areas have constructed raised beds directly on asphalt or concrete surfaces with successful results.

Square-foot gardening is a type of raised bed, typically four-feet-by-four-feet, which can be made relatively easily. Directions for constructing a raised bed frame can be found in the Edible Vegetable Garden activity section on page 29. One popular square-foot gardening design involves four four-foot-by-four-foot boxes with two-foot walkways between them, arranged in a square. Place two six-foot poles of bamboo or other material in the inner corners of each box and link in the middle, forming a bean pole teepee. These boxes are large enough for two classes of 36 students each to plant a plant in each square foot of space, with pole beans linking the plots together in the middle. For more information on square-foot gardening, refer to Bartholomew, M. Square Foot Gardening at www.squarefootgardening.org

In-Ground Row Gardening Basics

Vegetables, fruit trees, and flower beds (such as butterfly gardens) can all be grown directly in the ground as farmers have for centuries. Gardens can be as small as four-feet-by-four-feet or as large as the garden committee is willing to implement.

Before planting a garden in the schoolyard, dig several holes at the proposed site to collect soil samples for a pH test and to determine the soil type. Soil tests can be done with a test kit purchased at any gardening center or by the county Cooperative Extension Service. Most plants grow best with a pH of seven but some have different pH requirements. Low-lying or seasonally moist areas will require different plants than high, dry, sunny areas with sandy soil.

When creating an in-row garden plan, be sure to consider the following:

- Start a garden at least two feet from the building. Alkaline from the concrete block binds up iron in the soil, which causes plants to look pale between veins. Plant trees 15 feet from any building to protect building foundations and allow trees room to grow.

- When planning a vegetable or herb garden:
  - Create a walkway in between each row of plants at least three feet wide — this allows students access to their plants while not stepping in the beds. Ensure adequate space for wheelchairs and/or crutches.

- Row width will depend on the plants grown — a standard row width is two feet.
- Rows should run north to south.
- Work in fertilizer and other soil amendments before planting vegetables.
- Arrange low-growing vegetables (lettuce, turnips, radishes, etc.) along one side. Place medium-tall plants (peppers, bush beans, squash) in the middle, and tall growing plants (pole beans, sweet corn and vining tomatoes) along the other side.
- Avoid growing the same vegetables in the same spaces year after year to minimize pests and diseases.

Planting

When to Plant

Farmers divide Florida into four main growing regions: Northeast, Northwest, Central and South. Each of these areas has a slightly different date of the last frost and first frost of the season. Vegetables that would be damaged in freezing weather should be planted after the frost date. To find the frost date for your area, consult www.plantmaps.com/interactive-florida-first-frost-date-map.php, your county Cooperative Extension agent, or the current year's Farmer's Almanac. Flowers, trees and shrubs have specific planting times as well — these are given with plant information in the last chapter.

How to Plant

Crowded plants compete for light, air, space, water and fertilizer and will not grow well nor yield well. Each plant has an ideal "spacing" that should be written on the package of seed or the seedling tag of the plants you purchase. Spacing information is included for the plants highlighted in this guide. Be sure to follow these spacing guidelines; they will be different for every plant species. For example, some varieties of tomato are compact, and can be planted one foot apart; others require three feet of space. If plants are planted too close together, they may all grow smaller than anticipated, not produce fruit or seed, or not reach maturity.

All seeds may not germinate, so many seed packets advise "thinning" — planting many seeds in a row, then pinching off the weaker seedlings after they've grown one-to-two inches to create the correct spacing for plants. This step may be difficult for the first-time gardener. Remind students that thinning is a way to make sure the final plants have enough food to be healthy.

Watering

Watering in the morning is best for plants. The excess water on plants leaves and stem will evaporate during the day. If plants are watered at night, the water droplets on the plant leaves and stem remain on the plant creating an ideal surface for the growth of microorganisms which can introduce diseases to the plant. There is no magic formula for how much to water a garden. The amount depends on the soil type, the type of plants, your regional climate, and other factors. Classrooms can use the cup-and-bucket method to water their vegetable or herb gardens, minimizing the chance of students wetting one another in the fun of the chore. Each student can be assigned a margarine cup with their name, or a communal cup, and when the garden needs watering, each student can dip their cup into a bucket to water their plant carefully around the soil.

If watering with a hose by hand, students should apply water to the plants at the root and avoid spraying water directly onto plant leaves to help keep plants healthy. Heartier plants, such as those in butterfly and sensory gardens, can be watered with an overhead sprinkler on a timer. Automatic watering systems free teachers from the responsibility of watering the garden. However, it's important to get the timing of the system correct. The "finger test" is also useful.

To test if a plant needs to be watered, place an index finger in the soil – if the soil is moist (cool to the touch) from the top of the finger to the tip of the first knuckle (approximately two inches), the soil does not need water. Otherwise, water deeply. From a hose, it takes approximately:

- 30 minutes for a tree
- 3-5 minutes for a shrub
- 15-20 seconds to properly water flowers

Plants need water, but they also need air! Overwatering the plant means that you've filled up all the air pockets with water,

which means the plant roots can't breathe — be sure to keep the soil moist but not too wet. Overwatering is especially common with container plants — be sure to use the finger test before watering.

Soil 101

"Dirt" and "rock" can be found within many layers of the earth's crust, but soil refers to the first few feet of good growing material. The philosophy is to feed the soil, not the plant which will keep plants healthy and better able to resist pests. Creating good garden soil is like adding together ingredients of a recipe. The ideal mix is ¼ air, ¼ organic matter, ¼ water and ¼ minerals. Air is already available in a container garden by using potting mix (note: not potting soil). Air must be included in a hydroponics system using an aquarium pump or other method to aerate the nutrient solution. Air is added to raised beds or in-ground rows by digging into the soil and turning it over with a shovel, or by using a rototiller (this may be rented, or labor and equipment donated by a resource partner). Once the soil is tilled or turned under, be sure to keep students from stepping on it to keep the air in the soil.

Schoolyard soil in Florida typically contains a large amount of sand. While sand gives a garden good drainage and provides a part of the one-quarter part of air necessary for good garden soil, it does not usually contain enough organic matter. Peat moss, sawdust and other matter are like sponges in between the marbles in a bucket.

These minerals and other nutrients, in the form of fertilizer, must be added to your soil to improve the health of any plants you put in the garden. Organic and non-organic fertilizers are available for purchase. Be sure to follow label instructions. It is possible to make fertilizer from materials purchased at (or donated from) any gardening or home improvement store. Included in every fertilizer are the basic nutrients needed for healthy plants, similar to a multivitamin for humans. The combination of nutrients is important. If purchasing a ready-made fertilizer, be sure that it will be appropriate for your type of garden (a fertilizer with 5-10-10, or five percent Nitrogen, 10 percent Phosphorus and 10 percent Potassium is used in most vegetable gardens, for example, but citrus trees or blueberry bushes need a different formula).

In addition to fertile, well-watered soil, mulch is important to add at the top of the soil around the plants. Mulch helps the soil hold moisture, protects plant roots from erosion, encourages beneficial organisms that keep garden plants healthy, and helps keep weeds under control. An easy recipe for a weed-free garden involves covering the raised bed, row or container with six-to-eight sheets of newspaper, wetting it, then applying several inches of straw over top. Seedlings can be planted directly into this weed barrier by puncturing a hole where the seedling will be planted. If planting seeds, wait until seedlings come up and are at least two inches tall before installing the newspaper around them. The newspaper and straw can then act as the basis for the next season's garden.

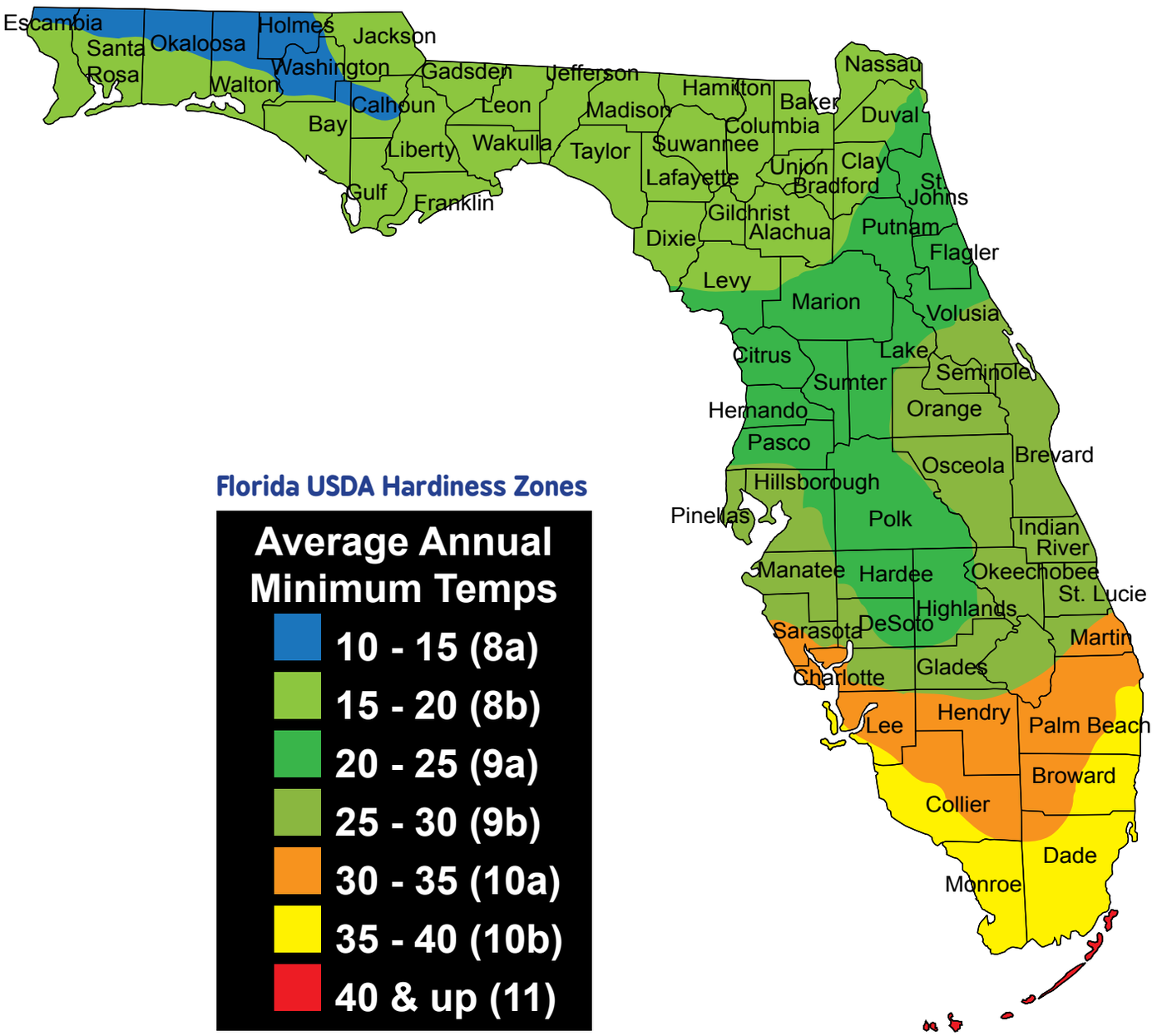
Soil Testing

In addition to the ideal recipe for soil, ingredients in the soil determine the pH, or acidity, of the soil. Most garden plants grow best in soil pH of 7.0 (neutral) to 5.8 - 6.5 (slightly acidic). The University of Florida provides soil testing services for a small fee. County Cooperative Extension agents typically test soil for free, and pH test kits can be purchased to test soil in the classroom. To properly collect a sample of soil, use a hand trowel to dig four-to-six inches into the garden soil at several corners, and the middle, of the garden area. Place a small amount from each area in a bag and mix the sample, which will give you an average pH of the garden area.

Welcome to Your Region!

Florida is different from any other state. While we commonly say Florida has four growing zones — Northwest, Northeast, Central and South — there are sub-zones within each, so referring to a zone chart can assist you with understanding the nuances of your area. Florida's six degree latitude difference from the northern to the southern tip creates 1 ½ more hours of sunlight in Miami than in Jacksonville each day. (www.edis.ifas.ufl.edu). These different latitudes create different climate zones throughout the state, from 8a to11 (see chart below), which translates to different planting times in each zone. It is important to know what region the school is in to help guide you to planting the right plants at the right time.

The zones should be used as a planting guideline, and is a factor you should consider, particularly in areas where freezing temperatures are likely certain times of the year. Novice gardeners should stick with crops labeled for their zone, and expert gardeners can venture out and plant crops for neighboring zones.



Florida USDA Hardiness Zones

Average Annual Minimum Temps

- 10 - 15 (8a)
- 15 - 20 (8b)
- 20 - 25 (9a)
- 25 - 30 (9b)
- 30 - 35 (10a)
- 35 - 40 (10b)
- 40 & up (11)

Search for your zone by zip code at *www.plantmaps.com/interactive-florida-usda-plant-zone-hardiness-map.php*

Choosing a Garden

Fruit Garden

Students' interest in gardening may be piqued by the thought of ripe, juicy strawberries or oranges in their schoolyard. Florida farmers grow many different fruit crops. A brief history of citrus farming, strawberry and blueberry farming is discussed here. Most temperate and tropical fruit trees take at least two years to bear fruit once they are planted. Thus, if planting a fruit tree orchard, keep the timing of the harvest in mind.

Citrus

Seventy percent of the United States' oranges, tangerines and grapefruit come from Florida. In 2013, this equaled 132 million boxes of oranges (95 percent of which was used for orange juice), and 18 million boxes of grapefruit (60 percent of which used for grapefruit juice). Hernando DeSoto was likely the first person to plant oranges as part of his exploration and settlement of the Tampa Bay area in1539.

Florida Fruit Gardens

Region	Trees	Fruit
Central	Citrus: Lime, Lemon, Grapefruit, Tangerine, Orange, Tangelo, Kumquat, Calamondin Temperate fruit: Apple[2], Peach[2], Pear Tropical fruit: Mango, Banana[1], Star Fruit/Carambola[1], Papaya[1], Loquat, Fig, Guava, Avocado	Pineapple[1], Strawberry, Raspberry, Blackberry, Blueberry, Grape[2]
South	Citrus: Lime, Lemon, Grapefruit, Tangerine, Orange, Tangelo, Kumquat, Calamondin Tropical fruit: Star Fruit/Carambola, Papaya, Loquat, Fig, Lychee, Barbados Cherry, Banana, Mango, Guava, Avocado	Pineapple, Strawberry, Raspberry, Blackberry, Blueberry, Grape[2]
Northeast	Citrus: Tangerine, Orange, Tangelo, Kumquat, Calamondin Temperate fruit: Apple[2], Peach[2], Pear, Raspberry, Blackberry, Blueberry Tropical fruit: Loquat, Fig	Grape[2], Blackberry, Blueberry, Raspberry
Northwest	Citrus: Tangerine, Orange, Tangelo, Kumquat, Calamondin Temperate fruit: Apple[2], Peach[2], Pear, Raspberry, Blackberry, Blueberry Tropical fruit: Loquat, Fig	Grape[2], Blackberry, Blueberry, Raspberry

[1] Requires covering during a frost. [2] May require significant amount of pesticides and fungal controls.

Adapted from: DeFreitas, S. Complete Guide to Florida Gardening and Adams, W.D. and Leroy, T.R. Growing Fruits and Nuts in the South.

By 1577, records show that the first citrus trees were planted in the Spanish settlements of St. Augustine. Franciscan friars established medicinal and fruit gardens in their successful mission sites, which induced the spread of oranges across the settlement region. These oranges were sour or bittersweet and used as a seasoning.

When the British acquired Florida in 1763, they found vast wild orange groves along the St. Johns, Halifax and Hillsborough rivers and around Orange Lake. Many of these old groves were cleared and planted with indigo, corn and cotton plantations under English ownership. By 1834, a crate of lime trees from China were imported to growers in the Mandarin and St. Augustine areas of Florida. Also imported with the lime tree seedlings was an insect called 'scale' that ate the foliage of the orange trees. The first sweet orange seedling was planted in 1834 at the mouth of the St. Johns River.

Sweet seedlings were harder to grow in different kinds of soil so some growers grafted, or combined, sour orange trees with sweet orange trees. Capt. Douglas A. Dummitt established a famous grove of sweet "Indian River Oranges" in the late 1800s, grown from wild sweet oranges. George Payne, the only practicing doctor in Alachua County up until 1850, spread sweet orange seedlings from China throughout the territory. Harriet Beecher Stowe had a citrus grove in Mandarin that she managed herself. Many growers used fertilizer in the form of muck from a lake/river, compost from manure, or topsoil from a nearby hammock, on their trees and hand-cleared under them to keep them free of weeds. By the 1870s, Florida was the place to renew health and amass a fortune and many invested in orange groves to turn a profit. The frost of 1894 killed many groves, but settlers discovered that trees growing near the forest survived.

Strawberries

Botanically speaking, strawberries are a vegetable because the fruit of a strawberry is each tiny seed on the outside of it. However, it is marketed as a fruit. It is native to North America. The varieties that thrive in Florida are a combination of northeastern and Texan varieties. Florida grows 15 percent of the total strawberries grown in the United States. Americans eat an average of 5.2 pounds of strawberries per person every year.

Blueberries

About 20 million pounds of blueberries are produced each year in Florida by certain varieties of plants which bloom and fruit earlier than blueberries elsewhere across the country, making them a very valuable commodity. Currently, more blueberry varieties are being developed which are suited to Florida's climate.

How to Plant a Fruit Garden for Small Spaces

Regions: All

Space needed: Each student's plant will occupy two square feet of space, plus a small area for the two citrus containers. This can be installed along a sunny stretch of walkway in front of a classroom, for example, or behind a classroom in an unused space.

Plant list:

1 strawberry plant for each student
1 Meyer lemon plant for each student
1 Tangelo plant for each student
1 store-bought pineapple for each student
1 Avocado

**Note: Mention to the citrus supplier that these will be container-grown. They may have dwarf varieties or trees grafted on Flying Dragon rootstock to help them thrive in containers.

Supply list:

1 empty gallon milk jug for each student
Scissors
China marker
Extra large black trash bags
1 10-inch pot for each student (can be re-used year after year)
Potting mix to fill each container
1 bale of straw for mulch
1 bag general-purpose 5-10-10 fertilizer
Citrus-specific fertilizer

Instructions:

Pineapple planting

It takes about two years for a pineapple to mature and bear fruit, but students can start the process in class.

1. Ask a local grocery store or wholesale club to donate enough pineapples for the class. If donations are not possible, ask students to each bring in a whole pineapple (or instruct them to have their parents cut the pineapple top off approximately an inch from where the leaves end, and bring in the tops).
2. Collect clean plastic one-gallon milk jugs with caps — one per student. Clear is best.
3. Using scissors, cut the milk jug in half just below where the handle stops (approximately five inches from the bottom). Cut evenly around the jug.
4. Keep the top of the milk jug so it can be used as a watering device.
5. In the bottom, use the scissors to make four small holes, one in each corner.
6. Fill each "pot" with potting mix, two inches from the top.
7. Each student can place his or her pineapple top in the pot, burying it to the leaves.
8. Write students' names on their pots with the china marker.
9. Add a cup of water to the new plant, and place in full sun. As plant roots do not like light, place a black plastic bag on the ground and place the class's pots together in the bag. Bring the edge of the bag up to cover the walls of the pots, and use the spaces between them to tuck the plastic around the perimeter.
10. Water weekly with tops of milk jugs.
11. Pineapples should be ready to transplant by the end of the school year. Remember to protect them from frost.

Strawberry planting

1. Have each student transplant their strawberry plant into a 10-inch diameter pot, using potting mix. Strawberry plants usually come in trays at local nurseries. When planting, make sure not to bury the crown (the part where the green stem starts) and make sure all the roots are covered. Place in a sunny spot.
   a. Alternative design: A strawberry pyramid for 80 students — Create a six foot-by-six foot box frame from two foot-by-six foot boards. Fill the area with potting mix. Build another box frame, this one five foot-by-five foot. Set it on top of the base and fill with soil mixture. Construct a third and fourth box (four-by-four and three-by-three, respectively.)
   b. Plant strawberries eight to12 inches apart in each layer of the pyramid.
2. Place straw or other mulch around plants — this will reduce fungus problems.
3. Place in a sunny location and water daily until the roots are established. Water every other day after that. Water around leaves but not on them.
4. The ideal temperature to grow strawberry plants is between 55 degrees and 78 degrees.
5. As fruit begins to set, be sure to place fruit on upper stems of leaves — do not let fruit touch the soil/mulch. It takes about 35 days from planting for strawberries to grow and ripen.

Citrus planting

1. Prepare a container at least two feet wide and two feet deep for each tree, filling it one-third full with potting mix.
2. Tip trees over on their side, and press lightly on the plastic pot to loosen root ball.
3. Gently slide plastic pot off and place tree into container. Tree should sit at least two inches from top of container.
4. Fill in potting mix along the sides. DO NOT put potting mix on top of root ball.
5. Add straw mulch around base of plant when finished potting.

Sample timeline:

- September: Students bring in pineapples — cut off tops and plant in milk jugs.
- October: Purchase strawberry plants and place in containers; add one cup of water per day to each plant until roots are established and every other day after that.
- November: Add one cup of water per week to each plant. One week, add general fertilizer to each.
- December: Add one cup of water per week to each plant.
- January: Enjoy strawberry harvest.
- February: Purchase citrus plants, and place in containers.
- March: Add citrus fertilizer to soil.
- April: If plants were purchased with fruit on them, it may be ready to enjoy.
- May: Students bring pineapples home to plant in their yards.

How to Plant a Vegetable Garden

Florida's climate has two main growing seasons during which different vegetables can thrive. The cool season starts in August and the warm season starts in February or March. Below is a partial list of cool and warm season vegetables that are popular in school gardens and will bear fruit within the semester [adapted from Stephens, J.M. (2006)].

Warm Season

Vegetable	Spacing	Seed depth	Planting date	Time to harvest
Bush beans	1 seed every 3 inches	1-2 inches	North: March-April Central: February-April South: September-April	8 weeks
Pole beans	1 seed every 3 to 6 inches	1-2 inches	Same as above	8 weeks, then continuous for several more weeks
Sweet corn	1 seed every 4 inches, thinned to 12 inches apart	1-2 inches	North: March-April Central: February-March South: August-March	8-12 weeks for transplants or seeds
Cucumbers	1 seed every 12 inches	1-2 inches	North: February-April Central: February-March South: September-March	7 weeks for seeds; 5 weeks for transplants
Peppers	1 seed every 12 inches	½ inch	North: February-April Central: January-March South: August-March	10-12 weeks for seeds; 8-10 weeks for transplants
Tomatoes	18-40 inches; consult label	½ inch	North: February-April Central: February- March South: August-March	10-12 weeks for transplants
Watermelon	15-60 inches; consult label	1-2 inches	North: March Central: January South: January	12-13 weeks for transplants or seeds

Cool Season

Vegetable	Spacing	Seed depth	Planting date	Time to harvest
Broccoli	12-18 inches	½-1 inch	North: August-February Central: August-January South: September- January	8-10 weeks from transplants (recommended); 10-12 weeks from seed
Cabbage	2-3 feet	½-1 inch	North: September-February Central: September-January South: September- January	10-12 weeks from transplants (recommended); 12-14 weeks from seed
Carrots	Plant seeds along trench, thin to 2-4 inches apart	1/8 inch: Sept.-March	Central: October-March South: October-February	9-12 weeks from seed
Cucumbers	1 seed every 12 inches	1-2 inches	North: February-April Central: February-March South: September-March	7 weeks for seeds; 5 weeks for transplants
Cauliflower	18-24 inches	½-1 inch	North: January-February Central: October- January South: October-January	10-12 weeks for seeds; 8-10 weeks for transplants
Lettuce	6-12 inches; consult label	¼ inch	North: February-March Central: September-March South: September-January	7-10 weeks for seeds; 6-8 weeks for transplants
Radish	1-2 inches	¾ inch	North: September-March Central: September- March South: October-March	2-3 weeks

How to Plant a Square-Foot Garden (warm season)

Regions: All Florida regions

Space needed: Two four-foot-by-four-foot raised beds with a three-foot walkway between them (44 square feet)

Plant list:

1 packet pole bean seeds
1 packet bush bean seeds
4 cucumber seedlings
4 cherry tomato seedlings
10 bell pepper seedlings

Supply list:

Four 2x10x16 foot boards, cut in half
16 deck screws
24 small nails
Drill
Hammer
Pointed-tip shovel
Tape measure
Potting mix
Trowels
Paint stirrers and china marker
5-10-10 fertilizer
String
1 bale of straw for mulch
Trellis for beans and cucumber, or locate frames next to fence
1 sheet of clear plastic

Instructions:

To construct the raised beds: Place two boards at right angles to each other. Drill two deck screws into the corner. Place two more boards to make a square, and drill six more deck screws — two in each corner. If situating garden on existing grass, place the frame over the site and mark with the shovel where the boards will be, then remove the frame. Dig out grass, etc. from inside frame boundaries and discard. Place frame back over bare dirt and fill with fertilizer mix. Mix thoroughly with shovel and smooth over.

Use the tape measure and china marker to mark one-foot intervals along each edge of the boards. Hammer a nail at each one-foot mark around the entire perimeter of the frame to ¼ inch from being flush with the surface of the board. Tie string around one nail and use string to mark each one-foot square.

Sample Square-Foot Garden Layout

Pole bean	Pole bean	Pole bean	Pole bean
Tomato	Tomato	Tomato	Tomato
Bush bean	Bush bean	Bush bean	Bush bean
Pepper	Pepper	Pepper	Pepper

Once finished, hammer nails flush with the surface of the board to prevent future injury.

To plant plants: The ideal time to transplant is in the afternoon, but work as time allows. Plant the pole beans along the northern side of the frame, so as not to shade the other plants. Otherwise, follow planting instructions. Around transplants, put a thick layer of straw as a weed barrier/mulch. Wait until seeds are up about two inches before putting straw around them, as many seeds need warmth and sunlight to germinate.

Sample timeline (Central Region):

January: Purchase materials and build beds.
February: Check Farmer's Almanac or Extension Service for last predicted frost of the year, and plant everything a week after that. Add one-to-two cups of water per week, as needed.
March: Add general fertilizer. Continue watering. Cucumbers may be ready.
April: Continue watering, and enjoy vegetable harvest.
May: Place clear plastic over beds to solarize or sterilize soil for the summer.

How to Plant a Pizza Garden

Pizza is a favorite food of many so the pizza garden is a fun layout to try in the schoolyard. This garden should be started in the spring to take advantage of Florida's unique growing season.

Regions: All Florida regions

Space needed: Gardens can be 10-to-50 feet in diameter

Plant list:

Tomato seedlings
Basil seeds
Pepper seedlings
Scallion sets (small onions; green stems are edible)
Oregano plants in small pots

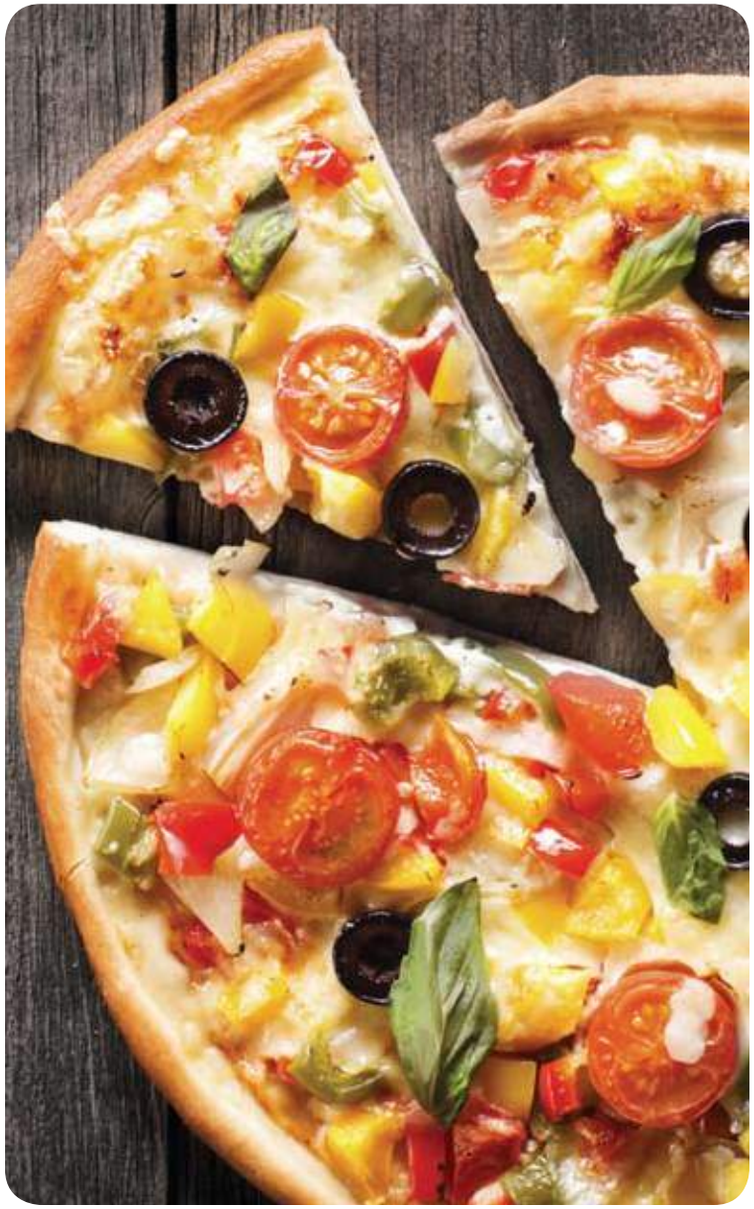
Supplies:

1 foot stakes (enough to mark the perimeter every five feet)
String
Mallet
Pine straw for walkways
Hay for mulch inside planting beds
Shovels
Fertilizer
Clear plastic

1. Remove any grass or unwanted vegetation from the site before getting started.
2. Hammer a one-foot stake into the center of the garden. Attach a string and measure to the outside edge of the garden space (typically 10 feet).
3. Holding the string, walk a circle along the outside-edge of the garden and hammer a stake into the ground every two steps (or five feet).
4. Connect the stakes with string to mark the boundaries of the garden.
5. Connect the stakes across the circle to make the "slices" or wedge-shaped beds.
6. The garden should be divided into eight pieces of equal size.
7. With a shovel, mark a walkway along each of the radiating strings as wide as needed.
8. With a shovel, mark an observational circle around the middle stake.
9. Shovel dirt from the walkway into the pizza beds to help define a boundary between the two areas.
10. Add fertilizer to pizza bed soil.
11. Add pine straw to walkways and hay to pizza beds (except in basil area).

Sample timeline (Central Region):

January: Prepare the site and build the beds.
February: Check Farmer's Almanac or Extension Office for last frost date. Plant peppers, scallions and basil after that.
March: Plant oregano and tomatoes. Add fertilizer to pepper and tomato plants. Water regularly (an automatic sprinkler on a timer works well).
April: Water regularly, and enjoy the harvest!
May: Cover garden with clear plastic to "solarize," or sterilize the soil during the summer.



How to Plant a Salsa and Soup Garden

Soup gardens can be created from any combination of cool or warm season vegetables. Each of these can be grown in a container or in the ground. A common recipe for a soup garden follows the story *Recipe to Make Stone Soup*, by Joseph Moser, and includes:

Cool Season Stone Soup

(If planted at beginning of season, should be ready by January.)

- Cabbage
- Carrots
- Kale
- Onions

Warm Season Stone Soup

(If planted at beginning of season, should be ready by May.)

- Beans
- Corn
- Peppers
- Tomatoes
- Summer squash

...then add:

- Basil, thyme, bay leaf
- Vegetable broth
- Rice
- 1 large, clean stone

Chop vegetables, place in a crock pot with vegetable broth to cover, cook until tender.

Salsa Garden

The salsa garden can be grown in containers and is one of the simplest to grow and prepare.

Plant list:

Tomato plants (Determinant cherry tomatoes work well.)
Bell pepper plants
Jalapeno or sweet pepper plants
Cilantro seeds

Supply list:

Potting mix
Proper diameter (dependent on recommended plant spacing) container per tomato plant
10-inch diameter container per pepper plant
Paint stirrers or popsicle sticks
China marker

Timeline:

January: Sow cilantro seeds
February: Plant peppers
March: Plant tomatoes
April: Enjoy harvest

Florida Guacamole

Try This Florida Recipe

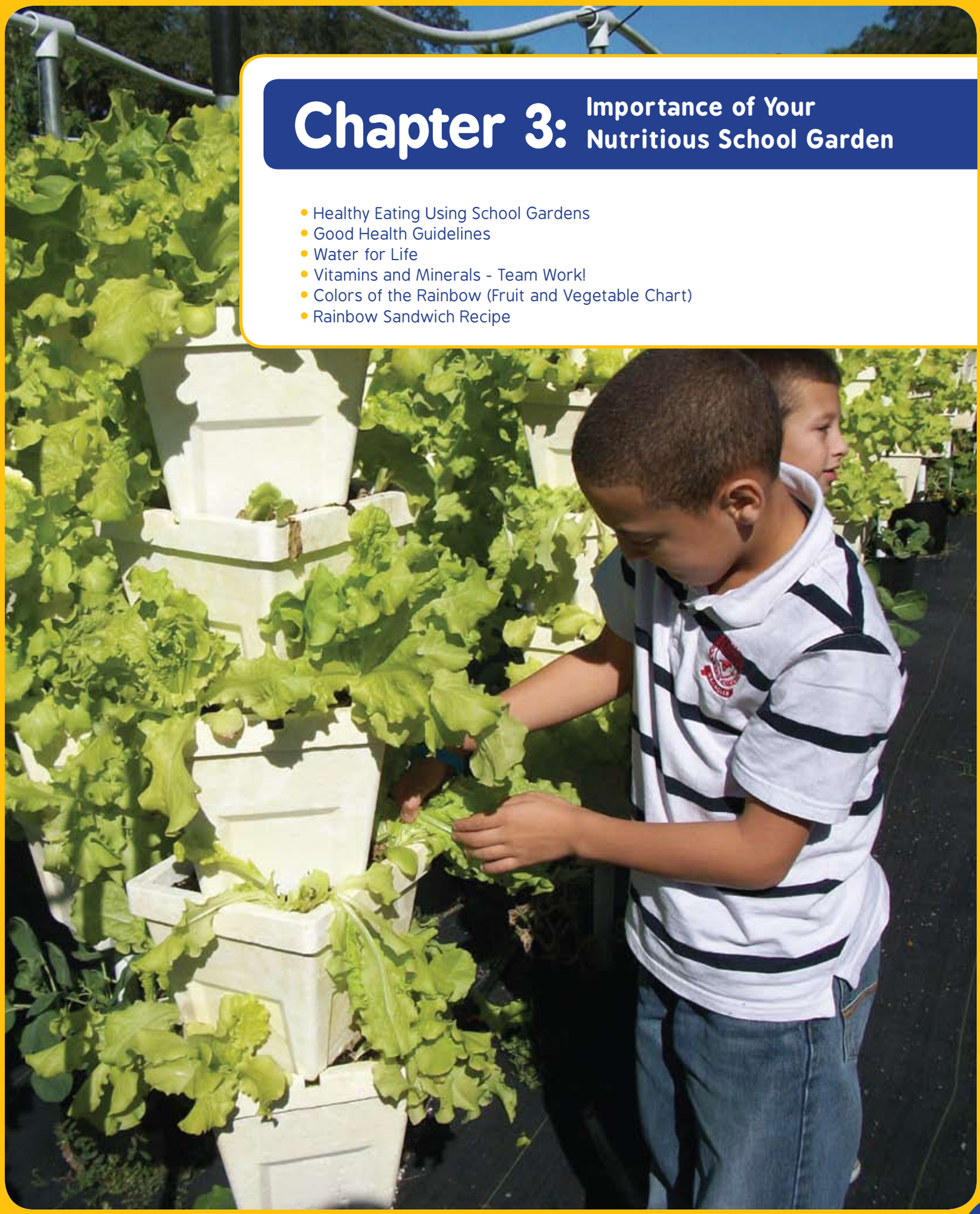
Ingredients

- 2 ripe Florida avocados
- 1/2 fresh Florida tomato, washed, cored and chopped into pieces about the size of your thumb nail
- 1 scallion, chopped
- 1 heaping tablespoon fresh cilantro leaves, rinsed with cold water and chopped into little pieces
- 1/2 fresh lime
- 1/2 teaspoon hot sauce (if you like)
- pinch kosher salt

Instructions

- Wash your hands with soap and water, then gather all your kitchen gear and ingredients and put them on a clean counter.
- With the help of your adult, slice each avocado in half. Remove the pit and scoop out the insides. Put the avocado in a bowl and using a fork, mash it until it is still chunky, not smooth.
- Add the tomato, scallion and cilantro leaves. Squeeze the lime and add the juice. Stir it all together, but not too much. Add hot sauce, if you like.
- Move the guacamole to a serving bowl and serve right away. Or, put the avocado pits in the guacamole (to prevent it from turning brown from the air), cover tightly with plastic wrap and refrigerate no more than four hours.

Fresh from Florida



Chapter 3: Importance of Your Nutritious School Garden

- Healthy Eating Using School Gardens
- Good Health Guidelines
- Water for Life
- Vitamins and Minerals - Team Work!
- Colors of the Rainbow (Fruit and Vegetable Chart)
- Rainbow Sandwich Recipe

Healthy Eating Using School Gardens

Nutrition education and providing healthy food in school is important to the development of good, lifelong eating habits. Leading national health organizations uniformly agree on the important role good nutrition plays on student development. Schools provide an excellent training ground or "learning laboratory" to maximize the experiences needed to support that effort.

School Gardens Improve Grades

Garden-based environmental learning is an educational strategy that uses school gardens to supplement instruction and improve academic achievement in a variety of subject areas. Research not only supports the role of environment-based education in academic achievement, but also finds that nutrition education programs linked to school gardens improve self esteem.

One of the strongest justifications for nutrition education, nutrition programs, and nutrition services in schools is the effect on students' cognitive performance and their educational achievement. School gardens provide an atmosphere that incorporates hands-on activities and strengthens academic, personal and social skills. School gardens also allow students to develop life skills in nutrition, leadership and decision making. It is well known that students' fruit and vegetable consumption is key to overall good health. However, daily intake by most students remains inadequate. Lorson, Melgar-Quinonez, and Taylor (2009) examined dietary intake data collected on more than 6,500 children ages 2 to18 from 1999 to 2002 as part of a National Health and Nutrition Examination Survey and compared it to recommendations for fruit and vegetable intake in the 2005 U.S. Dietary Guidelines for Americans. With fruit juice and French fries included in total fruit and vegetable consumption, the researchers found that only 50 percent of children ages 2 to 5 met recommendations for fruit intake, and 22 percent met recommendations for vegetable intake. In children ages 6 to 11, 26 percent met recommendations for fruit intake, and 16 percent met recommendations for vegetable intake.

Eat Five Fruits, Veggies A Day

Increasing the consumption of fruits and vegetables is a goal of the U.S. Department of Agriculture's national "5-A-Day" campaign and is recommended by the American Academy of Pediatrics (2003) for the prevention of obesity among students. Although there has been surprisingly little epidemiological or experimental research on the relationship between consumption of fruits and vegetables and obesity, it is known that inadequate consumption of vegetables among adolescents has been associated with a range of poor health outcomes including alcohol and drug use, being overweight and weight dissatisfaction. The consumption of fruits and vegetables, beginning in childhood, is an important predictor of higher fruit and vegetable consumption as adults and can help to prevent or delay chronic diseases.

Many students have limited exposure to healthy foods and often do not know where food comes from or how it is grown and prepared. Using the school setting to introduce and reinforce healthy behaviors through different forms of nutrition education, gardening and farming, is becoming widespread among schools in urban and rural areas. School garden and farm-based programs have the potential to promote health and well-being in students and may ultimately improve food choices from adolescence to adulthood.

Nutrition education programs must be engaging, age appropriate and sensitive to cultural differences among students to effect change. Programs that involve students in the growing, preparation and cooking processes provide increased access to

fresh produce and help link classroom education to hands-on experiences that afford the best long-term outcomes. These efforts help build a foundation of lifelong healthy diet choices.

Gardens containing fruit and vegetables change attitudes about particular foods. There is mounting evidence that active learning in less structured, participatory spaces like school gardens is more likely to transform student's food attitudes and habits. In addition, school gardening, especially when combined with a healthy lunch program and nutrition education, encourages more healthful food choices. Students are more likely to try eating vegetables they have grown themselves and to ask for these vegetables at home. When students share their new food preferences with their families, they help influence healthier eating habits at home as well.

School Lunch Program Revamped

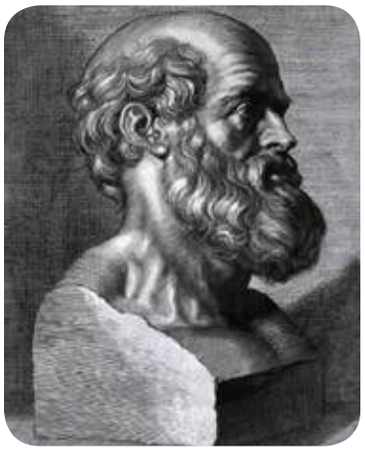
Toward that end, the national school lunch program was revamped in 2012 to meet new meal pattern and nutrition standards based on the latest Dietary Guidelines for Americans. The new standards include:

- Ensuring students are offered both fruits and vegetables every day of the week.
- Substantially increasing offerings of whole, grain-rich foods.
- Offering only fat-free or low-fat milk
- Limiting calories based on the age of students being served to ensure proper portion size.
- Increasing the focus on reducing amounts of saturated fat, trans fat and sodium.

Studies of dietary intervention programs that provide nutrition education through activities, hands-on food preparation, and taste-testing have shown an increased consumption of fruits and vegetables and increased levels of nutrition knowledge among study participants.

Australian researchers found in a March 2013 study that elementary students had an increased willingness to try new foods after they had grown and cooked them at school. Students who attended kitchen gardening classes were twice as likely to sample new foods as those who didn't participate in the program. While parents' feedback showed no evidence that the program boosted fruit and vegetable consumption at home, educators surveyed for the study said students brought healthier snacks and bag lunches to school and were more adventurous in trying new foods. (Journal of Nutrition Education and Behavior, March, 2013).

Good Health Guidelines



Hippocrates, the "father of medicine."

The science of nutrition dates back to the ancient Greeks. Hippocrates, the "father of medicine," born about 2,500 years ago, said: "If every individual could have the right amount of nourishment and exercise, not too little or not too much, we should have found the safest way to health." Not until the 19th century did the mystery of nutrition science begin to emerge. Research continues today as scientists explore emerging issues related to food and nutrients and their role in promoting health and protecting against disease.

While it is known that eating healthy is important, it isn't always easy to sort through all of the information available about nutrition and food choices. New information and updated research emerges all the time. It's hard to keep up and often very confusing.

Nutrition: Get Nutrients from Food

Nutrition (also called nourishment or aliment) is the process of absorbing nutrients from food and processing them in the body to support life. Nutrition is achieved in various ways by different forms of life. The green pigment chlorophyll gives plants their color and enables the process of photosynthesis to energy generation. Plants use this energy to build carbohydrates (sugar, starches, cellulose and lignans), fats or oils and proteins. Humans ingest and digest foods from plants and animals to absorb the nutrients they need to survive and flourish. Absorbed elements and compounds (nutrients) are circulated through the bloodstream to feed the body's cells and provide energy for work and play.

In nutrition, calories are referred to as units of energy, which are stored as nutrients in food and eaten by humans to provide the energy needed for the body to perform everyday tasks such as thinking, breathing and walking. Calories are locked inside of foods in the form of nutrients. When digested, they are converted into energy to power the body and stored for later use as body fat. Nutrients required for proper nutrition are categorized as either macronutrients (needed in relatively large amounts) or micronutrients (needed in small amounts). Macronutrients are carbohydrates (including fiber), lipids (fats and oils), protein and water. However, vitamins and minerals are micronutrients.

Nutrients required for proper nutrition fall roughly into three major groups: proteins, carbohydrates, and fats. However, vitamins, minerals, and water are also important.

Eat Daily from Five Food Groups

It is recommended to get nutrients from food first and to incorporate a variety of foods into a healthy diet to prevent deficiencies, excesses and imbalances which can negatively impact health. The number of food and nutrient servings needed each day from each food group depends on a person's daily caloric needs, age, sex, and level of physical activity. The three keys to healthy eating are: 1) balance – eating the correct number of servings from each food group, 2) variety – picking different foods within each food group and 3) moderation – being careful not to eat too much of any one food.

The five food groups are:

- Fruits
- Vegetables
- Grains
- Dairy
- Protein

skills. It is important to note that active youths usually turn into active adults. Even if teachers aren't required to teach nutrition education, they should consider folding it into their classroom instruction to do their part to address today's staggering obesity epidemic. Support and reinforcement from teachers about healthful eating and active living will help encourage students to make these practices part of their lifestyle everyday.

Children establish eating and exercise habits which last a lifetime so it's important to make nutrition and physical activity a priority during this time. They require larger amounts of nutrients and calories because of their rapid growth. Students from age six to 12 years grow about two inches and gain about five pounds a year, resulting in one to two feet of growth and a doubling of weight during this time. They generally don't need special foods, just enough of the right foods. In fact they need the same nutrients as their parents, just in different amounts. Nutrients students and teens generally do not get enough of are calcium, potassium, vitamin D, zinc, iron and fiber.

Second only to infancy, adolescence is the fastest growth stage in life. Teens need more calories and nutrients to support this rapid growth. Gender, body size, growth rate and physical activity determine caloric needs. Generally, boys from age 11 to 13 years need 1,800 to 2,600 calories a day compared to 2,200 to 3,200 a day when they reach 14 to 18 years. Girls from age 11 to 13 years need 1,800 to 2,200 calories a day compared to 1,800 to 2,400 when they reach 14 to 18 years. Genetics determines when and how much adolescents grow, but smart eating can help determine if they reach their maximum potential.

Healthy Lifestyle Includes Exercise

Physical activity is an essential part of being healthy. The Center for Disease Control advises at least 60 minutes of physical activity every day for kids to develop small and large motor skills. Activity does not have to occur all at once, but can be spread throughout the day. Good physical health and a healthy body weight are the best benefits of moving more. Active play also helps students develop social skills, build a positive self-image, enhance their ability to learn and help protect them from danger because they have developed a variety of motor

XXL Generation

The "XXL generation" as this generation has been called face a shortened life expectancy and chronic disease issues which will affect them at a younger age and result in earlier debilitation. Obesity-related conditions include heart disease, stroke, type II diabetes and certain types of cancer. Edward Stanley, British author and clergyman (1779-1849), wrote, "Those who think they have no time for bodily exercise will sooner or later have to find time for illness."

A student who is overweight by the age of 8 has an 80 percent chance of becoming an overweight or obese adult. In addition, if one parent in the household is overweight, a child has a 50 percent chance of becoming an overweight adult. It is important to teach students about where their food comes from and what it does for their bodies so they can begin developing healthy habits beginning at a young age.

The causes of obesity are multifaceted, but essentially poor eating habits and lack of regular physical activity are the main reasons. For example, portion sizes have gotten much larger in the last 20 years. Larger portion sizes mean more calories, and more calories mean more weight gain. Just 100 extra calories a day leads to a weight gain of 10 pounds in a year.

A study published in the Journal of the American Medical Association found that average portion sizes for nearly every category of food has increased since the late 1970s, both at home and at restaurants. Likewise, a report in the Journal of the American Dietetic Association found that many popular foods and beverages are now manufactured in sizes up to five times larger than when they were introduced. Portions for many of these foods now exceed federal recommended standards by as much as eight times! The result is that many people no longer know what a portion should look like. Understanding serving sizes is an important step toward getting enough nutrients and maintaining a healthy weight. One trick to mastering portion distortion is to use everyday objects to visually estimate portion sizes.

Use Common Items to Measure

According to the Academy of Nutrition and Dietetics:

- A teaspoon of butter or margarine is the same size as the tip of your thumb (to the first joint)
- Three ounces of meat is equal to a deck of cards
- One cup of pasta is about the size of a tennis ball
- One bagel is about four ounces or 3 inches in diameter
- 1 ½ ounces of cheese is the size of three dominoes
- Two tablespoons of peanut butter is roughly equivalent to a ping-pong ball
- A half cup of vegetables is about the size of a light bulb

A National Health and Nutrition Examination Survey (NHANES) compared obesity rates in students from 1976 to 1980 to those from 2003 to 2006 and found the following:

- The percentage of obese children ages 2 to 5 grew from 5 percent to 12.4 percent.
- The percentage of obese students ages 6 to 11 increased from 6.5 percent to 17 percent.
- The percentage of obese students ages 12 to 19 rose from 5 percent to 17.6 percent.

The NHANES is a program of studies designed to assess the health and nutritional status of adults and children in the United States. The survey is unique in that it combines interviews and physical examinations.

Overweight Americans Growing

For adults, the role models for our growing children, the statistics are equally staggering with more than a third of American men and women considered to be overweight and another third to be considered obese as measured by body mass index (BMI). BMI is calculated by using a person's height and weight. It provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems The terms "overweight" and "obese" describe weight ranges that are greater than what is considered healthy for a given height. The term "underweight" describes a weight lower than what is considered healthy for a given height. The southern United States has the highest prevalence of overweight people in the Nation, with Mississippi being the heaviest in 2011 (CDC).

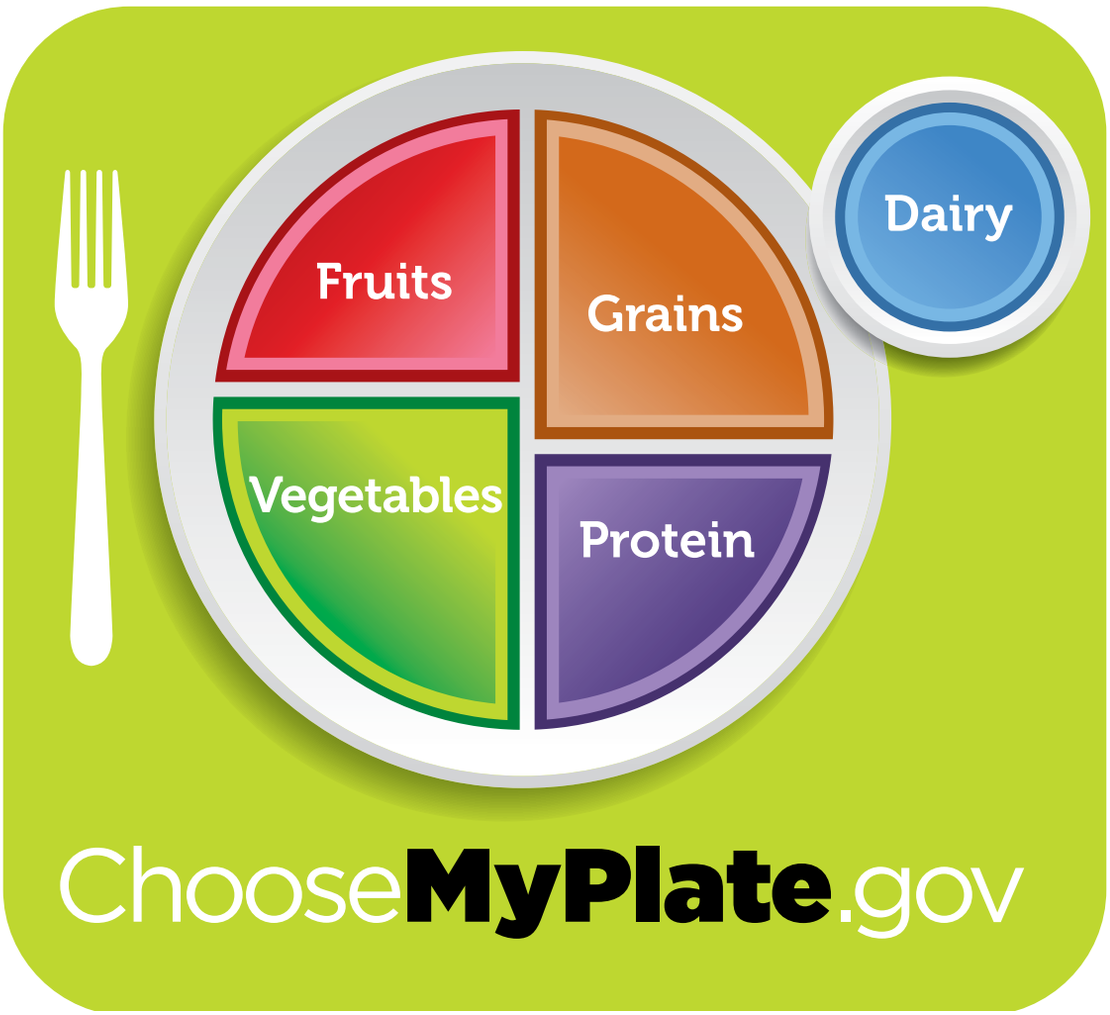
BMI charts for adults are not to be used for young children and students. Instead, the Centers for Disease Control and Prevention developed growth charts using percentiles and BMI to track girls and boys from 2 to 22 years of age (www.cdc.gov/growthcharts). Growth charts and BMI calculations are meant to track growth over time, and are not meant to diagnose weight status. Their growth is plotted based on age and gender and helps health care providers determine if growth is

occurring normally and if weight should be a concern. Healthy weight is considered to be between the 5th and 85th percentiles. Anything over the 85th percentile is considered overweight and over the 95th percentile is considered obese. Underweight is deemed to be anything under the 5th percentile.

Most governments provide regular and ongoing guidance on nutrition, health and physical activity, and some also impose mandatory disclosure and labeling requirements to help consumers make healthier choices. In the U.S., nutritional standards and recommendations are established jointly by the U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary and physical activity guidelines from the USDA are outlined by The Dietary Guidelines for Americans (DGA) and represented graphically by MyPlate. These guidelines and pictorial representations are updated every five years. This advice does not apply to toddlers or infants because their needs vary depending on their developmental stage.

The key recommendations for the 2010 Dietary Guidelines for Americans include:

- Balancing calories to manage weight
- Reducing or moderating:
  - Sodium
  - Saturated fat
  - Cholesterol
  - Trans fats
  - Solid fats
  - Added sugars
  - Refined grains that contain solid fats, added sugars and sodium
  - Alcohol
- Increasing:
  - Fruit and vegetable intake
  - Whole grains
  - Fat free or low fat milk and dairy
  - Lean protein and meats
  - Seafood variety
- Building healthy eating patterns
- Increasing physical activity



Water for Life

Water is essential. It makes up about 60 percent of human body weight. It is one part oxygen and two parts hydrogen and supplies no calories or other nutrients. Every system in the human body depends on water. For example, water regulates body temperature, flushes out toxins from vital organs, carries nutrients to human cells, provides a moist environment for ear, nose and throat tissues, lubricates joints, cushions organs and tissues and softens stools to prevent constipation. About 15 percent of the body's total water supply forms in body cells when energy is obtained from carbohydrates, proteins and fats. Both energy and water are the end products of metabolism.

Lack of Energy Means Dehydration

Lack of water can lead to dehydration, a condition that occurs when there isn't enough water to carry out normal human functions. Even mild dehydration (10 percent of human weight) can drain the body's energy, make a person feel tired or lead to heat stroke. Twenty percent water loss is life threatening. In fact, the body can live without food for about six weeks, but only one week without water. The average adult loses about 10 cups of water daily through perspiration, urination, bowel movements and breathing. In hot, humid weather that number goes up significantly. Daily water needs vary, but the body is very good at balancing water intake and loss. It's very hard to over consume water because the body's kidneys eliminate any excess. Thirst is the first signal that indicates the body needs more fluid. To determine if enough water is being consumed, check the color of the urine excreted. A small volume of dark-colored urine generally indicates not enough water is being consumed. Pale or almost colorless urine means the body is adequately hydrated.

Students Need 7-14 Cups of Water

The Institute of Medicine has determined that men need to drink 3.7 liters or 13 cups of water a day and women need to drink 2.7 liters or 9 cups of water a day. Children and teens need between 1.7 and 3.3 liters or between 7 and 14 cups a day, respectively. The amount of daily water intake should be adjusted depending on a person's activity level, the climate of where he or she lives and his or her general health. No set formula exists, but in general an active person needs to drink two cups of water for every pound of water lost during exercise.

Remember, the amount of water a person needs to drink every day includes water in food and other beverages. On average, food provides about 20 percent of the water needed daily. For example, juicy fruits and vegetables such as celery, lettuce, tomatoes and watermelon contain more than 90 percent water. Even dry foods like bread contain some water. Other beverages such as coffee, tea, juice, milk, soda, energy drinks, sports drinks, sugar-sweetened fruit drinks and even alcohol may quench thirst and contribute to your daily fluid needs. However, these beverages also contain unwanted calories. Currently these types of beverages contribute approximately 400 calories a day to the diets of individuals over two years of age. Water is still your best choice because it's calorie-free, inexpensive and readily available.

See 'Colors of the Rainbow Fruit and Vegetables Chart' on pages 43-46

Vitamins and Minerals - Team Work!

Vitamins and minerals are found in the food we eat every day. Fruits and vegetables support every process that occurs in the human body. More than 40 nutrients have been identified. A balanced amount of the different nutrients are needed and differ from person to person depending on their sex, age, activity level and health. Many foods contain the same nutrients but in differing amounts so it's important to eat a variety of foods every day to ensure you get an adequate amount of what you need.

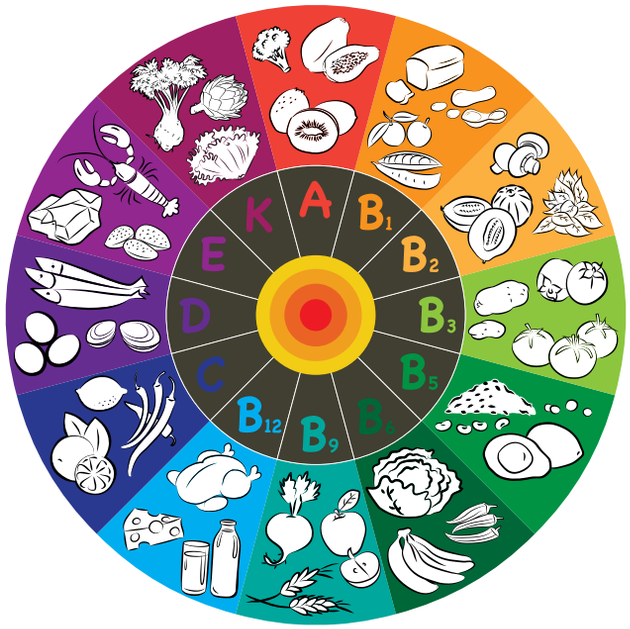
Minerals are essential for life as they are part of every cell in the body. They make up only four percent of our body weight but can be found in our bones, teeth, muscles, blood and body tissue. They regulate enzyme processes, give our body structure, regulate fluid balance, contract muscles and transmit nerve impulses. Minerals can be classified into two groups: major and trace depending on how much is needed.

Major, Trace Minerals Important

Major minerals are needed in amounts greater than 250 milligrams a day and can be found in calcium, phosphorus and magnesium along with three electrolytes, sodium, chloride and potassium that work together to control fluid balance and nerve impulses. Trace minerals are needed in much smaller amounts – 20 milligrams a day. They include: chromium, copper, fluoride, iodine, iron, manganese, molybdenum, selenium and zinc. Other trace elements not essential for human health include: arsenic, boron, nickel, silicon and vanadium.

Vitamins regulate body processes and act as partners with other compounds such as enzymes and proteins to cause reactions. Vitamins can be classified into two groups: fat-soluble and water-soluble. Their names describe how they are carried in food and transported throughout the body. Fat-soluble vitamins include A, D, E and K. They dissolve in fat and are carried throughout the bloodstream attached to fat or lipid molecules. That is one very important reason we need to have some amounts of healthy fat in our diets. Fat-soluble vitamins can be stored in the body which can lead to excesses or toxicity if consumed in large amounts over an extended period of time.

Water-soluble vitamins dissolve in water and are also carried by the blood. Because water-soluble vitamins generally cannot



be stored by the body, you need to consume foods with these vitamins on a regular basis. Toxicity is not generally a problem with this class of nutrients because the body excretes what it doesn't need. However, excess amounts of some water-soluble vitamins may strain certain organs. Many people rely on supplements to get what they think their body is missing, but eating a healthy, balanced diet with lots of color will ensure your body gets exactly what it needs.

Body Regulates Micronutrients

Vitamins and minerals are classified as micronutrients because our body needs very small amounts compared to macronutrients, carbohydrates, fats and proteins. Unlike carbohydrates, fat and protein, vitamins and minerals do not supply direct energy or nourishment to our body, but they do regulate the processes that make energy available. Our body is very efficient at regulating the delicate balance of vitamins and minerals it needs, but deficiencies and excesses can result from a poor diet, illness or over-supplementation.

Other food components such as phytonutrients, antioxidants, prebiotics and probiotics offer additional nutrition and health benefits. Phytonutrients or phytochemicals are naturally occurring plant chemicals that promote health by working with our bodies own processes to slow down the aging process and ward off or reduce the risk of disease development.

Plants produce phytochemicals to ward off parasites, insects, drought and the sun. It is what gives plants their color, aroma, texture and flavor. Over 2,000 plant pigments have been identified, but only a few hundred have been studied. Like nutrients, phytochemicals are grouped according to their biochemical composition and function and are found in varying amounts in different plants. See the 'The Colors of the Rainbow Fruit and Vegetables Chart' on pages 43-46.

Antioxidants are another class of plant compounds promising anti-aging properties and disease prevention. These vitamins, minerals, carotenoids and polyphenols significantly slow down or prevent the damage from the normal oxidative processes that produce unstable free radicals. Free radicals cause tissue and cell damage, making these cells unstable and dysfunctional and subject to the disruption of normal DNA function. This unhealthy cell state can cause infection, disease and cancer. Three antioxidant vitamins appear to neutralize free radicals: beta carotene and other carotenoids, vitamins C and E.

The best source of antioxidants comes from food! There are no recommended daily amounts recommended of these super compounds so eating a wide variety of fruits, vegetables, whole grains and nuts is the best way to get what the body needs.

The Colors of the Rainbow Fruit and Vegetables Chart

Food	Macronutrients					Minerals (mg)										Water H20 (g)
	Serving Size	Calories kcals	Protein PRO (g)	Carbohy-drate CHO (g)	Fat (g)	Sodium	Calcium	Magnesium	Zinc	Manganese	Potassium	Phosphorus	Iron	Copper	Selenium	
						Vitamins (mg)										
						Vitamin A (mcg)	Vitamin C	Vitamin B-1	Niacin	Vitamin B-12	Pantothenic Acid	Vitamin E	Vitamin B-2	Vitamin B-6	Folate	
Avocado, Florida, raw	1 medium 10.7 oz.	365	7	6	31	6	30	73	1	.29	1067	122	.52	.95	0	240
						21	53	.06	2	0	3	8	.16	.24	106	
Beans, green snap, raw	1 cup	34	2	8	.10	7	41	28	.26	.24	230	42	1	.08	.70	99
						38	18	.11	.80	0	.10	.50	.12	.08	41	
Blueberries, raw	1 cup	83	1	21	.50	1	9	9	.23	.49	112	17	.41	.08	.10	122
						4	14	.05	.6	0	.18	.80	.06	.08	9	
Cabbage, green, white, raw	1 cup shredded	18	.90	4	0	13	28	8	.13	.11	119	18	.33	.01	.20	65
						4	26	.04	.2	0	.15	.10	.03	.09	30	
Cantaloupe, raw	1 cup piece	60	2	14	.30	28	16	21	.32	.07	473	27	.37	.07	.70	160
						299	65	.07	1	0	.19	.10	.03	.13	37	
Celery, raw	1 medium stalk 7 ½" long	6	.30	1	.10	32	16	4	.05	.04	104	10	.08	.01	.20	38
						9	1	.01	.10	0	.10	.10	.02	.03	14	
Corn, yellow, raw	1 cup	132	5	29	2	23	3	57	.69	.25	416	137	.80	.08	.90	117
						14	10	.31	3	0	1	.10	.09	.08	71	

The Colors of the Rainbow Fruit and Vegetables Chart

continued

Food	Macronutrients					Minerals (mg)										Water H20 (g)
	Serving Size	Calories kcals	Protein PRO (g)	Carbohydrate CHO (g)	Fat (g)	Sodium	Calcium	Magnesium	Zinc	Manganese	Potassium	Phosphorus	Iron	Copper	Selenium	
						Vitamins (mg)										
						Vitamin A (mcg)	Vitamin C	Vitamin B-1	Niacin	Vitamin B-12	Pantothenic Acid	Vitamin E	Vitamin B-2	Vitamin B-6	Folate	
Citrus																
Orange, Florida, raw	1 medium 2 ½"	65	1	16	0	0	61	14	.11	.03	238	17	.13	.06	.70	123
						16	63	.14	.60	0	.35	.30	.06	.07	24	
Grapefruit, raw	½ medium 3 1/4"	38	.70	10	.10	0	14	9	.08	.01	164	9	.11	.06	.40	107
						54	41	.04	.30	0	.33	.20	.02	.05	12	
Tangerine, raw	1 medium 3"	45	.70	11	.30	2	31	10	.06	.03	139	17	.13	.04	.10	72
						29	22	.05	.30	0	.18	.20	.03	.07	13	
Cucumber, raw	1 large 8 1/4" long	45	2	11	.30	6	48	39	.60	.24	442	72	.84	.12	.90	287
						15	8	.08	.30	0	.78	.10	.10	.12	21	
Lettuce, loose (leaf), raw	1 medium stalk 7 ½" long	8	.80	2	.10	16	20	7	.10	.14	109	16	.48	.02	.30	53
						207	10	.04	.20	0	.08	.20	.04	.05	213	
Mushrooms, common white, raw	1 cup pieces	15	2	2	.20	4	2	6	.36	.03	223	60	.35	.22	7	65
						0	1	.06	3	.03	1	0	.28	.07	11	
Peanuts, raw	1 oz.	159	7	5	14	5	26	47	.92	.52	197	105	1	.32	2	2
						0	0	.18	3	0	.49	2	.02	.13	34	

The Colors of the Rainbow Fruit and Vegetables Chart

continued

Food	Macronutrients					Minerals (mg)										Water H20 (g)
	Serving Size	Calories kcals	Protein PRO (g)	Carbohy-drate CHO (g)	Fat (g)	Sodium	Calcium	Magnesium	Zinc	Manganese	Potassium	Phosphorus	Iron	Copper	Selenium	
						Vitamins (mg)										
						Vitamin A (mcg)	Vitamin C	Vitamin B-1	Niacin	Vitamin B-12	Pantothenic Acid	Vitamin E	Vitamin B-2	Vitamin B-6	Folate	
Peppers																
Sweet, yellow, raw	1 medium 4" long	50	2	12	.40	251	31	.51	.20	.10	4	20	22	.32	.22	172
						19	341	.05	2	0	.31	0	.05	.31	48	
Sweet, red, raw	1 medium 3" long	37	1	7	.40	5	8	14	.30	.13	251	31	.51	.20	.10	110
						187	152	.06	1	0	.38	2	.10	.35	54	
Sweet green, raw	1 medium, 2" long	24	1	6	.20	4	12	12	.15	.15	208	24	.40	.08	0	112
						21	96	.07	.60	0	.12	.40	.03	.27	12	
Potato, red-skinned, raw	1 medium 2" x 3"	149	4	34	.30	13	21	47	.70	.30	969	130	2	.29	1	173
						0	18	.17	2	0	.59	0	.07	.36	38	
Zucchini summer squash, raw	1 cup sliced	18	1	4	.20	11	17	19	.33	.20	296	43	.40	.06	.20	107
						11	19	.05	.06	0	.18	.01	.16	.25	33	
Winter Squash, butternut, raw	1 cup cubed	63	1	16	.10	6	67	48	.21	.28	493	46	.98	.10	.70	121
						745	29	.14	2	0	.56	2.0	.03	.22	38	
Strawberries, raw	1 cup	46	1	11	.40	1	23	19	.20	.56	220	35	.59	.07	.60	131
						1	85	.03	.60	0	.18	.40	.03	.07	35	
Sugarcane (white, granulated)	1 TSBP	46	0	12	0	0	0	0	0	.10	0	0	0	0	0	0
						0	0	0	0	0	0	0	0	0	0	
Tomato, red, raw	1 medium	11	.50	2	.10	3	6	7	.11	.07	147	15	.17	.04	0	59
						26	8	.02	.04	0	.06	.03	.01	.05	9	

The Colors of the Rainbow Fruit and Vegetables Chart

continued

Food	Macronutrients					Minerals (mg)										Water H20 (g)
	Serving Size	Calories kcals	Protein PRO (g)	Carbohy-drate CHO (g)	Fat (g)	Sodium	Calcium	Magnesium	Zinc	Manganese	Potassium	Phosphorus	Iron	Copper	Selenium	
						Vitamins (mg)										
						Vitamin A (mcg)	Vitamin C	Vitamin B-1	Niacin	Vitamin B-12	Pantothenic Acid	Vitamin E	Vitamin B-2	Vitamin B-6	Folate	
Tropical Fruit																
Banana, raw	1 medium 7-8"	105	1	27	.40	1	6	32	.18	.32	422	26	.31	.09	1	88
						4	10	.04	.8	0	.39	.10	.09	.43	24	
Blackberry, raw	1 cup	62	2	14	.70	1	42	29	.76	.93	233	32	.89	.24	.60	127
						16	30	.03	.9	0	.4	2	.04	.04	36	
Carambola, (star fruit), raw	1 medium 4"	28	.90	6	.30	2	3	9	.11	.03	121	11	.07	.13	.50	83
						3	31	.01	.30	0	.36	.10	.01	.02	11	
Fig, raw	1 medium 2"	37	.40	9	.20	0	18	8	.08	.06	116	7	.18	.04	.10	40
						4	1	.03	.2	0	.15	.10	.02	.06	3	
Lychee (litchee), raw	1 medium	7	.10	2	0	0	0	1	.01	.01	17	3	.03	.02	.01	8
						0	0	.01	.01	1.4	3	22	.07	1	0	
Mango, raw	1 medium 7 oz.	135	1	35	.10	4	21	19	.08	.06	323	23	.27	.23	1	169
						79	57	.12	1	0	.33	2	.12	.28	29	
Papaya, raw	1 medium	119	2	30	.40	9	73	30	.21	.03	781	15	.30	.21	.03	270
						167	188	.08	1.0	0	.66	2	.10	.06	116	
Pineapple, raw	1 cup pieces	78	.80	20	.20	2	20	19	.19	1	169	12	.45	.17	.20	133
						5	74	.12	.8	0	.33	0	.05	.17	28	
Watermelon, raw	1 cup pieces	46	.90	12	.20	2	11	15	.15	.06	170	17	.36	.06	.60	139
						43	12	.05	.30	0	.34	.10	.03	.07	5	

Chapter 3 Resources:

Research Supporting the Importance of your Nutritious School Garden

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-Murphy, JM. April, 2003. Findings from the Evaluation Study of the Edible Schoolyard. Center for Ecoliteracy, Berkeley, California.

- Pothukuchi, K. 2004. Hortaliza: A Youth Nutrition Garden in Southwest Detroit. Children, Youth and Environments 14(2):124-155.

Walters, Lynn, Executive Director, Cooking With Kids, Inc. December 3, 2008. Cooking With Kids: Hands-on Food and Nutrition Education for a Healthy Future. Senate Health, Education, Labor and Pensions Committee Field Hearing Confronting Childhood Obesity: Creating a Roadmap to Healthier Futures.

This list was compiled by:

- www.kidsgardening.org/node/13152
- Laura Stanley and posted to the ASFS listserve . If you have additional studies you can contribute to this list, please contact Laura: email laura.anne.stanley@att.net

www.mayoclinic.com/health/water/NU00283/NSECTIONGROUP=2
American Dietetic Association Complete Food and Nutrition Guide, Duyff, Roberta Larson, Academy of Nutrition and Dietetics, 2012.

Rainbow Sandwich

Try This Florida Recipe

Ingredients

- 2 slices whole wheat bread
- 1 slice of cheese
- Red produce: Florida tomato, Florida red pepper or radish
- Orange produce: carrot or carrot salad
- Yellow produce: Florida yellow bell pepper, or hummus
- Green produce: Florida cucumber, lettuce, spinach, sliced green apple, Florida avocado, pesto, or fresh herbs
- Purple produce: cabbage or cabbage slaw

Instructions

- Wash your hands with soap and water, gather all your kitchen gear and ingredients and put them on a clean counter.
- Start with a slice of bread, your favorite slice of cheese and your choice of condiment.
- Then layer on the color.

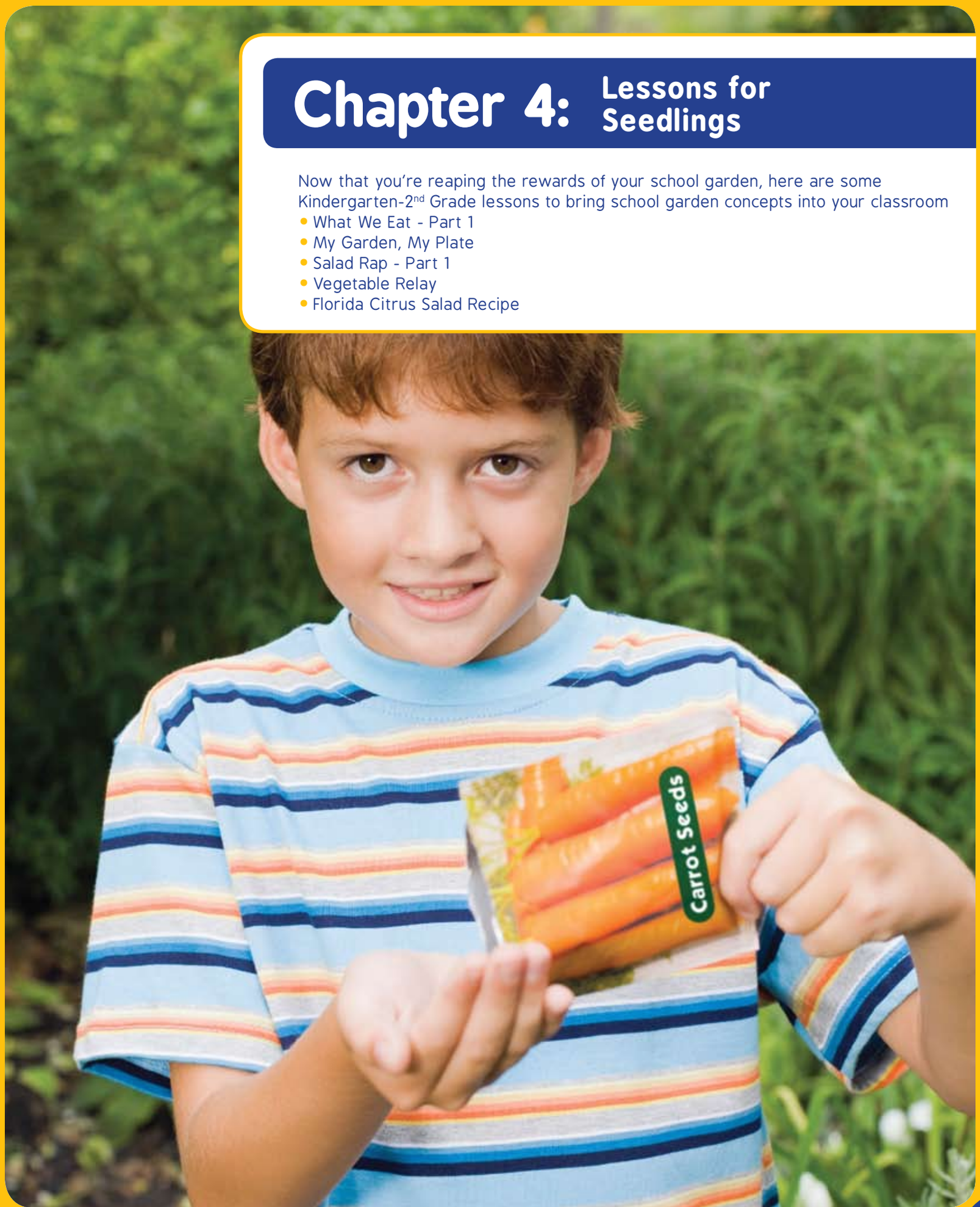
*You can substitute lettuce leaves for bread.

Fresh from Florida

Chapter 4: Lessons for Seedlings

Now that you're reaping the rewards of your school garden, here are some Kindergarten-2nd Grade lessons to bring school garden concepts into your classroom

- What We Eat - Part 1
- My Garden, My Plate
- Salad Rap - Part 1
- Vegetable Relay
- Florida Citrus Salad Recipe



What We Eat - Part 1

Subjects Taught: Science, Nutrition, Language Arts

Grade Levels: Kindergarten - 2nd Grade

Brief Description: Students will sort fruits and vegetables by examining plants - grown in the school garden, purchased in the market, or featured in models or pictures - into the parts of the plant eaten as food, identify a serving size, and locate where on MyPlate the food belongs.

Objectives: The students will:

1. Identify the parts of the plant.
2. Sort fruits and vegetables by plant part.
3. Sort images of produce into botanically correct fruits and vegetables.
4. Place sorted fruits and vegetables into *MyPlate*.
5. Describe and provide a general explanation of the nutrients provided by fruits and vegetables.

Life Skills: Analyzing, applying, collaborating, comparing similarities and differences, contrasting, categorizing, identifying, observing, sharing observations, sorting and understanding cause and effect

Materials Needed:

- Plants for students to dissect
- Plastic knives to use for dissection
- Paper towels to dissect on
- Fruits and vegetables from the school garden, pictures of fruits and vegetables, models of fruits and vegetables and/or purchased fruits and vegetables
- Copies of student handout *Parts of the Plant* – one per student
- Copies of student quiz *What We Eat* – one per student
- Grocery store advertisements with fruits and vegetables listed and pictured
- Scissors
- Tape or glue
- Music for parading
- *Tops and Bottoms* by Janet Stevens

Time:

Activity One: 45 minutes, plus time for student work
Activity Two: 45 minutes
Activity Three: 30-40 minutes
Activity Four: 30 minutes

Preparation:

1. Decide what portion of the background information is appropriate for your students.
2. Make copies of the student handouts and quiz, one per student.
3. Collect grocery store flyers and seed catalogs for pictures.

Vocabulary:

Flower, food, fruit, leaf, produce, root, stem

Background Information:

What are we eating? Is it a root? Is it a stem? Is it a leaf? Is it a fruit? Is it a seed? Is it actually a vegetable? Few adults could answer correctly. Some of the confusion is due to common use terminology versus the correct scientific designation between what is a fruit and what is a vegetable. If a food is sweet or served as dessert, we have considered it a fruit. Actually, there is a scientific botanical designation of fruit. In laymen's terms, if it has a seed or is a seed it is, botanically, the fruit of the

Florida Standards Met At-A-Glance

National Next Generation Science	K-LS1-a., K-PS1-c
English/Language Arts	K.W.1.2, K.W.3.7, K.W.3.8, 1.W.3.8, 2.W.3.8, K.SL.1.1, K.SL.1.2. , K.SL.1.3, K.SL.2.4, K.SL.2.5, 1.SL.1.2, 1.SL.1.3, 1.SL.2.4, 1.SL.2.5, 2.SL.1.2, K.L.3.5, K.L.3.6, 1.L.3.5, 1.L.3.6.
Mathematics	K.MD.2.3
Social Studies	SS.K.E.1.4
Physical Education	PE.1.L.2.8, PE.1.R.1.3, PE.2.L.2.11
Science	SC.K.L.14.3, SC.1.L.14.2, SC.1.L.17.1, SC.2.L.17.1

plant. So, grains are plant fruits. Tomatoes are plant fruits. Cucumbers, squash, and pumpkins are all plant fruits.

So, what are vegetables? Vegetables are the vegetative part of the plant and the reproductive part of the plant before they bloom and set fruit and seed.

Vegetables are:

Leaves: head lettuce, leaf lettuce, cabbage, spinach, bay leaves, oregano, sage, parsley, basil, rosemary, thyme, tea, dill weed, cilantro, mint
Modified Leaves: onions, celery, Brussels sprouts, garlic
Flowers: broccoli, cauliflower, artichoke, cloves, saffron
Stems: cinnamon, asparagus
Modified Stems: potatoes, turnips, ginger
Roots: carrots, beets, parsnips, sweet potatoes, radishes, turmeric

Botanical Fruits are:

almonds, apples, bananas, barley, beans, black walnuts, blueberries, brazil nuts, cacao (source of chocolate), cantaloupes, cashews, cherries, coconuts, cola nuts, corn, cucumbers, currants, dates, figs, gooseberries, grapes, hazelnuts, hickory nuts, lemons, limes, mangoes, oats, oranges, peaches, peanuts, peas, pecans, peppers, plums, pumpkins, raspberries, rye, snow peas, sorghum, squash, sweet corn, strawberries, tomatoes, walnuts, watermelon, wheat

Spices from Botanical Fruits are:

allspice, chili powder, caraway, cardamom, coriander, dill seed, mace, mustard, nutmeg, paprika, pepper, vanilla, cinnamon

Of course, it isn't always so simple. Strawberries, commonly considered a fruit, are the one major exception from a scientific perspective. The fruit is actually the seed on the outside of the strawberry. The sweet, juicy portion that we eat strawberries for is actually a vegetative holder of the seeds and not truly a fruit.

For some food plants, both the fruit and vegetative portions are used. This is true with dill. The leaves are used as dill weed, the immature flower heads are used as a flavoring in dill pickles, which are vegetative. The dill seed (fruit) are also used in making dill pickles and as a spice. The leaves of the cilantro plant are used in Mexican cooking as an herb (vegetative) but when the plant develops seed (fruit) it is used as a spice and is known as coriander.

The nutrition of various fruits and vegetables is directly related to the plant structure and purpose of that portion of the plant. For example, seeds need a great deal of energy to sprout and push through the soil to reach the light. In order to accomplish these feats, the seed must be a storehouse of energy. So seeds store carbohydrates and lipids (fats and oils). Fats and oils contain more than twice the calories of carbohydrates and protein, gram for gram. Seeds also need protein to form the structure of the new plant prior to it being able to conduct photosynthesis and create new protein. So, a seed contains oil or fat, protein, and carbohydrates in the form of starch and cellulose. All of our major grain crops are seeds: corn, wheat, rice, oats, barley, rye, quinoa and soybeans. Some crops are raised primarily for oil production such as rapeseed used to produce canola oil. All of our nuts are seeds.

Vegetative parts of the plant contain cellulose or in some cases lignin (woody fibers), which provides strength to the structure of the plant. Humans cannot digest cellulose or lignin so this provides us with fiber. The vegetative parts of the plant are operation centers of plants. Photosynthesis takes place in the leaves and stem. Transportation occurs in the roots, stem and venation in leaves. Food storage is conducted in the leaves, stem and roots depending on the plant, which is where sugars, starches, vitamins and minerals are found.

Introduction

1. Review with students the parts of the seed and process of seed germination. A good website is the Arizona Cooperative Extension Master Gardener's site at *www.ag.arizona.edu/pubs/garden/mg/botany/seeds.html*
2. Review photosynthesis as appropriate. Students should be able to explain that plants produce food by capturing the energy of sunlight and that all foods begin with plants.
3. Either collect grocery store flyers or ask students to bring in grocery store flyers that contain fruits and vegetables from the newspaper.

Activity One: Parts of a Plant

1. **Opener:** Read the book *Tops and Bottoms* by Janet Stevens. Ask: "What difference would it have made if Bear knew more about the food plants in the garden?" Explain that that is what we are going to find out.
2. **I do:** Display the image of the plant.
3. **I do:** Explain that the roots take in water and nutrients, the stem helps transport those nutrients and water up to the leaves and flowers and leaves take in sunlight and air (CO_2 during the day and O_2 at night) to produce food.
4. **I do:** Provide students a copy of the handout *Parts of the Plant*.
5. **We do:** Have each team of two students dissect a plant and correctly place each part on their *Parts of the Plant* handout on page 55.

6. **We do:** Together, each pair of students decides what the name of that plant part is.
7. **You do:** Have each student label the roots, leaves, flowers, and stem on the *Parts of the Plant* handout.

Activity Two: Fruits or Vegetables?

1. **Opener:** Have students brainstorm a list of fruits and vegetables or foods made from fruits and vegetables. Make a list and post the list in a visible place.
2. **I do:** Explain the difference between fruits and vegetables. (If it is a seed or has a seed it is botanically a fruit. If it is the leaf, stem, flower or root of a plant it is a vegetable.) Create a class T-chart to show what produce is botanically a fruit and what is a vegetable.
3. **We do:** Have students think about a fruit then share their choice with the class. Add it to the T-chart and repeat the process with a vegetable.
4. **You do:** Have students create their own T-chart with fruits on one side and vegetables on the other. Using grocery store ads have students cut out images of fruits and vegetables and paste or tape them onto the correct area of their T-chart.

Fruits	Vegetables
	
	
	

Activity Three: Plants We Eat

1. **Opener:** Have students brainstorm the plants we eat and what part of that plant we eat and post a list in a visible place.
2. **I do:** Show students various plant parts and identify whether they are leaves, stem, flower, or roots.
3. **We do:** Have students select a fruit or vegetable image from one of the grocery store flyers as their example. Divide the class in half and make one half form a circle this will be the inside circle and the other half form the outside circle. Have the inside circle parade clockwise and the outside circle parade counterclockwise when the music plays. When the music stops the person nearest them is their partner. Have the students show their partner their produce example. The partner must identify what part of the plant the fruit or vegetable is. Repeat several times to practice identifying plant parts that are eaten. Ask each student to remember what examples their partners had and which plant parts those examples represented.
4. **You do:** Have students complete the *What We Eat* quizzes on pages 54 and 57.

Activity Four: MyPlate

1. **We do:** Have the students identify where the fruits and vegetables fit in *MyPlate* on page 58.
2. **We do:** Have students brainstorm all of the seeds or foods from seeds they can think of, the foods made from those seeds and make a list in a visible place. Students may work together in small groups and younger students may need to have categories provided.
   Corn: corn tortillas, corn chips, corn flakes, corn puffs, corn cereals like Captain Crunch, corn oil
   Wheat: bread, egg noodles, pizza crust, crackers, cereals, spaghetti, muffins, cakes, cupcakes
   Oats: oatmeal, Cheerios, Honey Bunches of Oats, Granola, oat cakes
   Soybeans: Edamame, tofu, soy nuts, soymilk, vegetable oil,
   Rice: rice, puffed rice cakes, Rice Krispies, many of the Chex cereals, Rice-a-Roni, rice pudding;
   Coconut, Cacao (chocolate), Nuts, Peanuts
3. **I do:** Ask: "Where do these foods from seeds fit in *MyPlate*?"
4. **We do:** Ask: "What is a serving size for fruits, vegetables, and a food made from seed such as bread?" Discuss using the recommendations at www.choosemyplate.gov/ or use the student workbooks at http://www.fns.usda.gov/tn/discover-myplate-student-workbooks.
5. **You do:** Have students create their own diorama, poster or illustration depicting their favorites including one from each part of the plant and include where their favorites fit on *MyPlate*.

Evaluation Options:

1. Assess student work on the two handouts for accuracy and completion.
2. Have the students complete the *What We Eat* quiz and assess the accuracy.

3. Have student identify foods from leaves, roots, flowers, and/or stems that are grown in the school garden and place them into categories for leaves, stems, roots, flowers and seeds.
4. Have students create their own *MyPlate* using grocery store flyers that include fruits and vegetables, and carbohydrate foods such as bread, pasta, rice, or noodles, meat, and milk. Have students identify serving sizes and cost to purchase the food.
5. After lunch, have students categorize the foods in the school lunch into parts of the plant.

Extensions and Variations for Early Elementary Students:

1. Enlist the assistance of the school cafeteria to include kid-friendly vegetables in the school meal. Ideas can be found atwww.choosemyplate.gov/food-groups/downloads/TenTips/DGTipsheet11KidFriendlyVeggiesAndFruits.pdf

Resources:

Arizona Master Gardeners, Arizona Cooperative Extension, www.ag.arizona.edu/pubs/garden/mg/botany/seeds.html

Florida Master Gardeners, University of Florida Cooperative Extension www.gardeningsolutions.ifas.ufl.edu/giam/index.html

MyPlate, United States Department of Agriculture, www.choosemyplate.gov/

Stevens, Janet. *Tops and Bottoms*. Houghton Mifflin Hartcourt. 1995. ISBN-13: 978015292513.

What We Eat

Sample Pre-Post Assessment

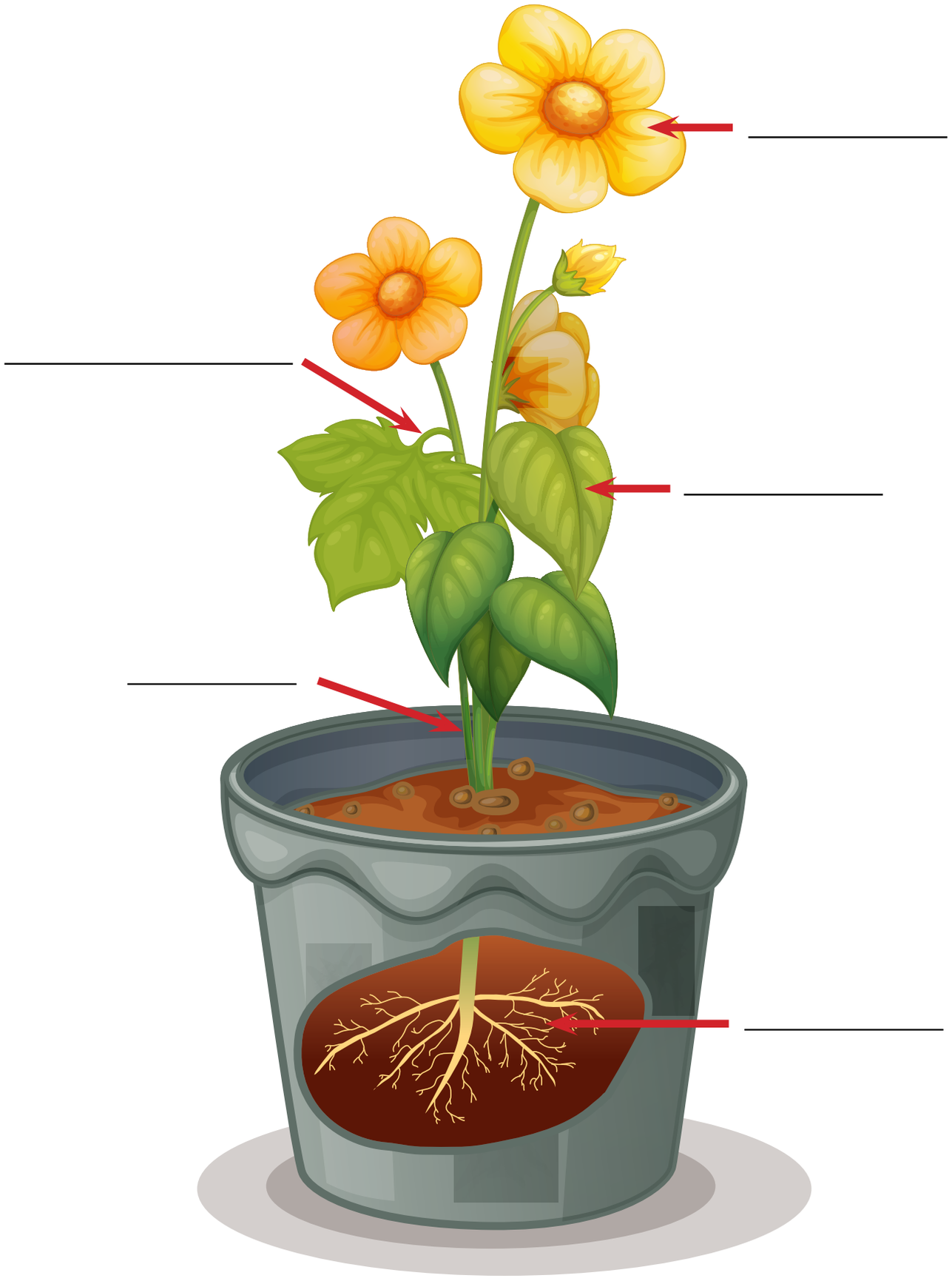
1. Name one vegetable that we eat that is a root:

2. Name a leaf that we eat as food:

3. What are three foods made from seeds?

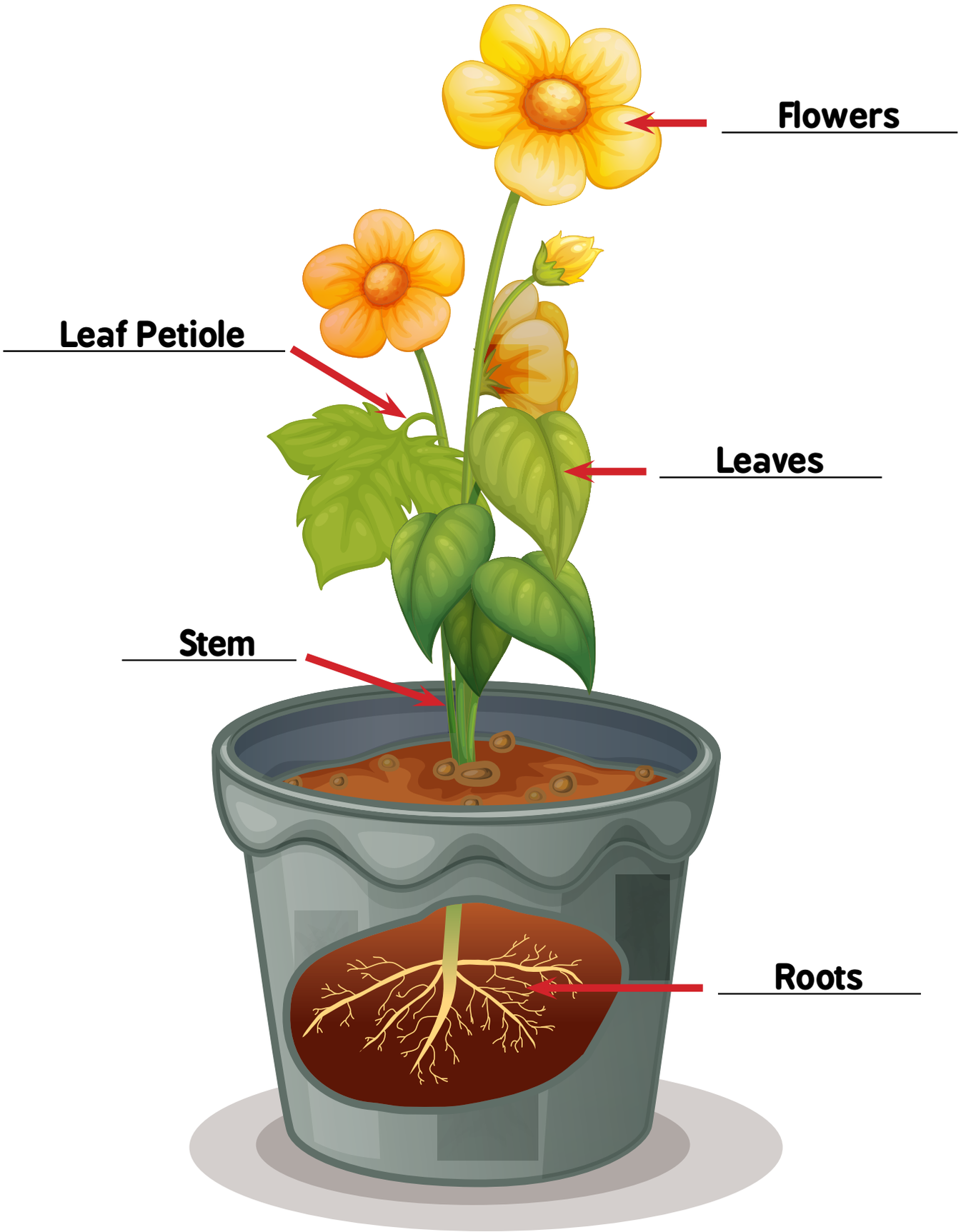
Parts of the Plant

Name:_____



Parts of the Plant

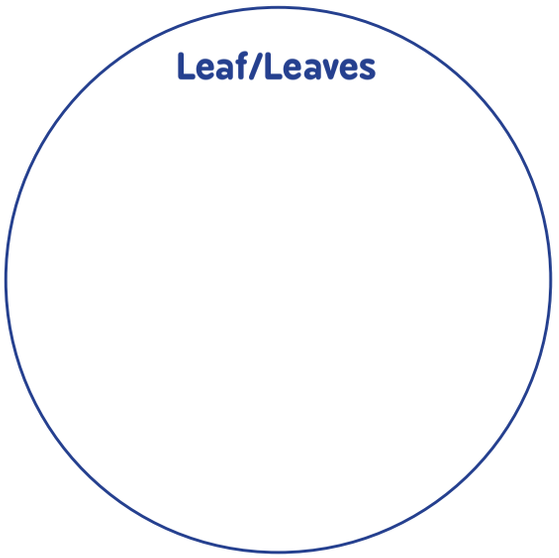
Name: Answer Key

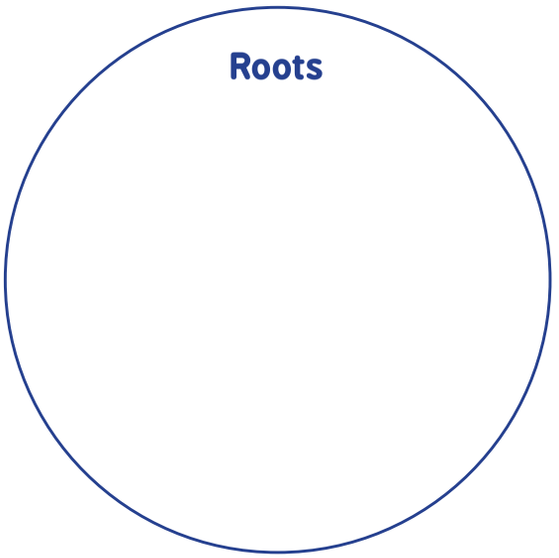


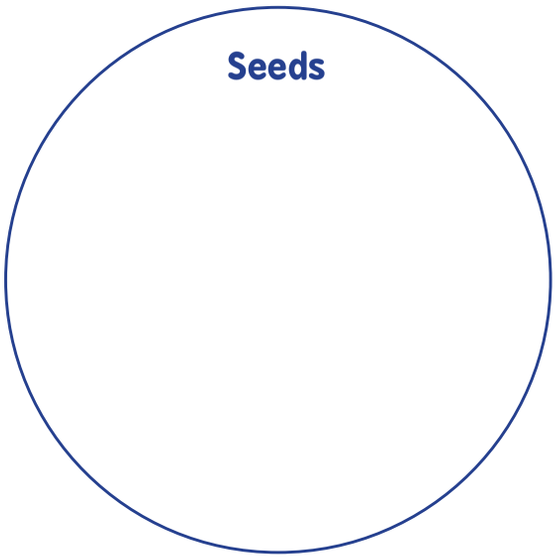
What We Eat Quiz

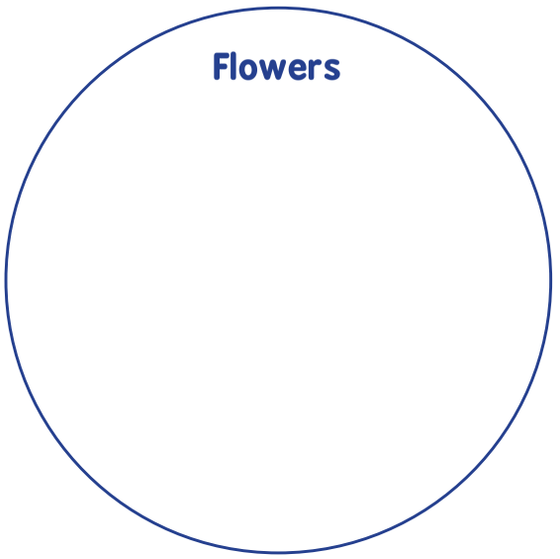
Name _____

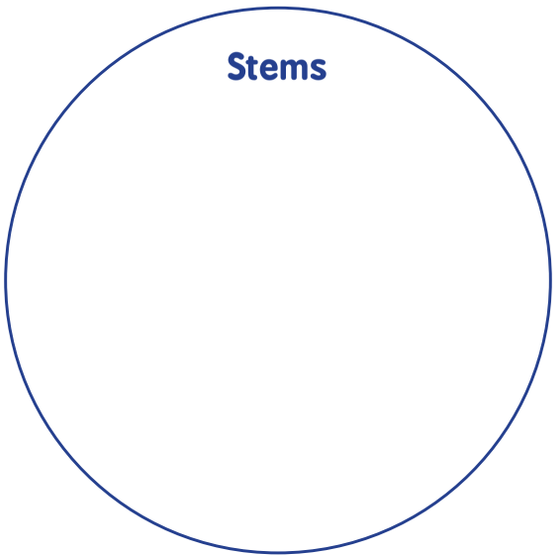
Put a picture of the food we eat on its plant part.

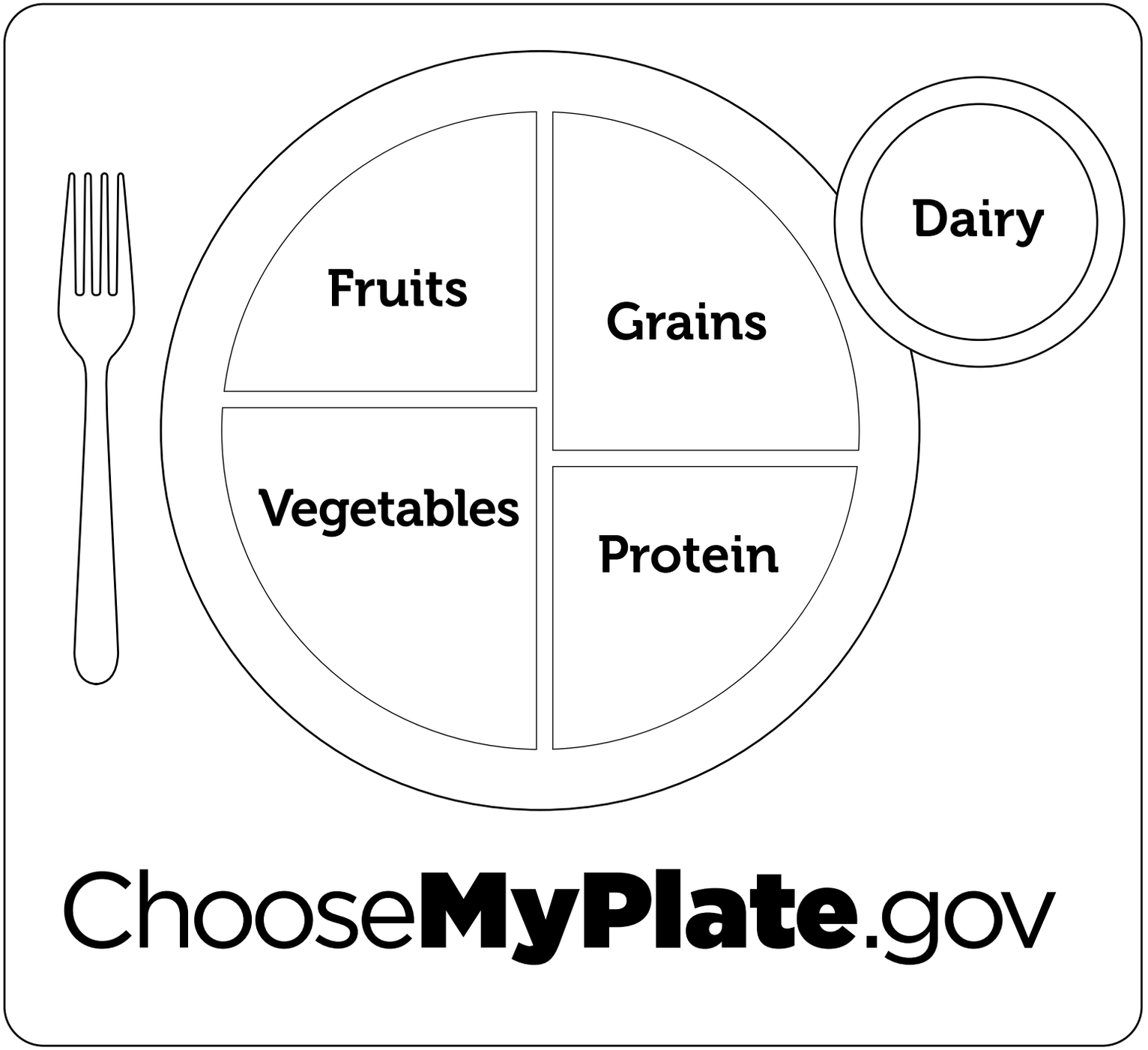












USDA Center for Nutrition Policy and Promotion

My Garden, MyPlate

Subjects Taught: Health, Physical Education, Language Arts, Science, Mathematics

Grade Levels: Kindergarten -2nd Grade

Brief Description: Students will become familiar with the foods they eat and healthy eating habits while learning about the *MyPlate* food categories.

Objectives: Students will:

1. Write a name of a food in the correct area of the *MyPlate* handout.
2. Draw a picture of that food item for each section of the *MyPlate* diagram.
3. Identify where the fruits and vegetables grown in the school garden should be placed on the *MyPlate* diagram.

Life Skills: communicating, following directions, identifying, making healthy choices, sorting

Materials Needed:

- *MyPlate* handout: www.choosemyplate.gov/food-groups/downloads/MyPlate/ColoringSheet.pdf or on page 58.
- crayons
- magazine or Internet pictures of foods for each area of *MyPlate* diagram

Time:

15 minutes for collection of food pictures/magazines
1 hour activity – may be broken into several lessons, depending on time frame or grade level

Preparation:

1. Print out or obtain a poster-sized *MyPlate* to post in the classroom.

2. Print out copies of *MyPlate* diagram for each student.
3. Gather magazines, grocery store advertisement, or Internet pictures for student use.
4. Gather materials for students to color their own foods.

Vocabulary: fruit, grain, menu, vegetables

Background Information:

Teacher should be familiar with the *MyPlate* graphic organizer, including food categories. If not, please review the information at www.choosemyplate.gov

Florida Standards Met At-A-Glance

National Next Generation Science	K-PS1-a., K-PS1-c., 1-LS3-a., 3-LS1-a., 2-LS2-a
English/Language Arts	K.W.1.2, K.W.3.8, 1.W.3.8, 2.W.3.8, K.SL.1.2, K.SL.1.3, 1.SL.1.2, 1.SL.1.3, 2.SL.1.2, K.L.3.5
Physical Education	PE.K.L.2.6, PE.1.L.2.8, PE.1.R.1.3, PE.2.L.2.11
Health	HE.K.B.2, HE.K.B.3.2, HE.K.P.1.1, HE.K.P.2.1, HE.1.C.1.1, HE.1.P.1.1, HE.1.P.2.1, HE.2.C.1.1, HE.2.P.1
Science	SC.K.N.1.1, SC.K.L.14.3, SC.K.P.8.1, SC.1.N.1.1, SC.1.L.14.1, SC.1.P.8.1, SC.2.N.1.1, SC.2.L.17.1

Introduction :

Teacher asks, "What did you have for breakfast this morning?" Students draw a quick sketch or write down a list of their breakfast foods within the areas of a *MyPlate* diagram as a pre-assessment. Some students may have eaten "combination" foods for breakfast and therefore get confused on where to put these items [combination foods are a single serving of a dish that contains two or more of the required meal components, such as a breakfast burrito that may have eggs (meat/meat alternate component), cheese (dairy/dairy alternate component) and wheat (grain/grain alternate component) in the tortilla]. Tell the student to dissect the components of the food and put the components into the different areas of *MyPlate*. Below is a link to help the kids understand combination foods and where they belong.

Worksheet that helps kids with combination food identification: www.nourishinteractive.com/nutrition-education-printables/120-food-groups-combinations-kids-elementary-school-worksheet

Activity One:

1. **Opener:** Read one of the books about nutrition listed in the resource section and have students listen to a read aloud about healthy eating in order to begin a discussion about healthful eating.

2. **I do:** Post a poster size *MyPlate* diagram on the wall or board to help students determine where foods would be placed on this chart. On the *MyPlate* diagram show students how you would place their lunch or breakfast foods into the correct areas of the poster.
3. **We do:** Students engage in a think-pair-share about their lunch food items. They think about one of their breakfast foods and what part of the plate it would go in (10 seconds). They share with a partner for one minute about where their food would go on the *MyPlate* diagram. Students raise their hands and draw or write their food on the class *MyPlate* diagram for discussion.
4. **You do:** Students work in pairs, and each pair needs its own *MyPlate* diagram. They look for photos in magazines and sort into each category on the *MyPlate* diagram where these photos of food items fit.
5. **Closing:** When groups are done, put the student partners' posters around the class. Have students engage in a museum tour walking silently and looking at other students' work. Engage in a follow-up discussion about foods and food groups related to healthy eating.

Activity Two:

1. **Opener:** Have students review the *MyPlate* chart made from the previous day.
2. **We do:** Visit the school garden and identify what is growing there. If more than one grade gardens, visit their areas and learn what they are growing.
3. **We do:** Return to the classroom and make a list of the foods in the garden or have the students draw pictures of each.
4. **We do:** Have students place the pictures on either their own copy of *MyPlate* or the poster-size *MyPlate* diagram.
5. **I do:** Teacher draws a "before" and "after" *MyPlate*. Teacher draws all of the items she had for lunch. Teacher then draws new items of what she should have had for lunch (adding a fruit or vegetable).
6. **We do:** Students think of one item to change from their lunch today and share with their shoulder partner.
7. **You do:** Students draw their "before" and "after" *MyPlates* for their lunch.
8. If a student has juice for lunch make sure they read the label to find out if it is 100 percent juice or a juice drink.

Evaluation Options:

1. Have students place food words or drawings on a *MyPlate* diagram with 90 percent accuracy.
2. Have students sort food pictures on a *MyPlate* diagram with 90 percent accuracy.

3. Have students describe when they could include foods from the garden into their meal plan for the day and where that food would fit on *MyPlate*.

Extensions or Variations:

1. Use the website www.eatright.org with student games and information at www.eatright.org/NNM/content.
2. Use the website *Fruit and Veggie Champions* for ages 6 – 8 at www.foodchamps.org. It hosts independent games.
3. Use the website *ReadWorks* at www.readworks.org. (You must register, but registration is free.)
4. Celebrate National Nutrition Month in March.
5. Older students could research their own state's school nutrition laws.
6. Use the online assessment game from the Food and Nutrition Services Agency of the United States Department of Agriculture at: www.fns.usda.gov/multimedia/Games/Blastoff/BlastOff_Game.html.

Resources:

Hawley, Ella. *Exploring Food & Nutrition*. Rosen Publishing, 2012.

Llewyllyn, Claire. *Why Should I Eat Well?*. Barron's Education.

Sears, William and Martha Sears. *Eat Healthy, Feel Great*. Little, Brown Books, 2002.

Brown, Laura Krasny and Marc Brown. *Dinosaurs Alive and Well: A Guide to Good Health*. Little, Brown Books, 1992.

Carle, Eric. *The Very Hungry Caterpillar*. Philomel Books, 1986

Credits:

National Nutrition Month website
www.eatright.org/NNM/content.aspx?id=5342#.UDl-PR9b8uwB

MyPlate, U.S. Department of Agriculture
www.choosemyplate.gov/

MyPlate diagram, U.S. Department of Agriculture www.choosemyplate.gov/food-groups/downloads/MyPlate/ColoringSheet.pdf

MyPlate Analysis form, U.S. Department of Agriculture
www.choosemyplate.gov/food-groups/downloads/worksheets/Worksheet_2800_18plusyr.pdf

CPalms website
www.cpalms.org/Standards/FLStandardSearch.aspx

Readworks website
www.readworks.org

My Garden, MyPlate

Sample Pre-Post Assessment

1. Draw or describe what you had for breakfast this morning.

2. What food categories does this include?

3. Where do these foods fit on a *MyPlate* diagram?

Salad Rap - Part 1

Subjects Taught: Music, Language Arts, Physical Education, Nutrition

Grade Levels: Kindergarten - 2nd Grade

Brief Description: Students create a rap song/chant and dance promoting the components of their favorite salad, and use chant as a device to remember that plants do not eat and only plants produce food.

Objectives: Students will:

1. Learn a rap song as a device to remember that plants do not eat, they produce food.
2. Identify rhyming words to complete rap template.
3. Identify sensory words by experiencing the garden and use those words to complete a rap.
4. Share rap songs with other students.

Life Skills: applying, creating, describing, rhyming, sorting, speaking in public, writing

Materials Needed:

- Magazines or seed catalogs that can be cut apart
- Grocery store flyers
- Paper, pen and/or pencil
- Music

Time:

Introduction: 15 minutes
Activity One: 1 hour
Activity Two: 1 hour

Preparation:

1. Visit websites to familiarize yourself with teaching children how to use rap music to teach poetry writing and specific techniques that are useful at all ages:
   Raps for Kids, My Word Wizard at www.mywordwizard.com/raps-for-kids.html
   Cheers, Chants, Raps, and Poetry, Songs for Teaching, www.songsforteaching.com/chantsraps.htm
   The Hip Hop Handbook, Academic Entertainment at www.academicentertainment.com/hiphop
2. Examine and if desired make copies of age appropriate Rhyming Worksheets to facilitate the process at www.education.com/worksheets/rhyming
3. If students have not learned the difference between wants or needs, then the lesson "Need It or Want It" on the Teacher Center of the Florida Agriculture in the Classroom website at www.faitc.org needs to be completed.

Vocabulary: Chant, rap

Background Information:

Connecting music to learning connects emotion to thinking and creates strong neural pathways in the brain that aid in long-term retention of knowledge and skills. Chanting and rapping has many of the same benefits of music. It establishes rhythmic patterns that can serve as memory prompts, make learning easier, improve motivation and provide students with a sense of community with the rest of the class. In addition, chanting/rapping and the accompanying motion appeals to visual, auditory and kinesthetic learners. It is fun. When students enjoy what they're learning, learning is not a chore, it is a pleasure. Beginning with a rap song to remember that plants do not eat (they make their own food), this lesson will provide students with a fun way to remember key facts about plants.

Activity One:

1. Complete the lesson *What We Eat – Part 1* prior to this lesson.

Florida Standards Met At-A-Glance

National Next Generation Science	K-LS1-1, 2-LS4-1
English/Language Arts	K.W.1.2, K.W.1.3, K.W.3.8, 1.W.1.3, 1.W.3.8, 2.W.1.3, 2.W.3.7, 2.W.3.8, K.SL.2.4,1.SL.1.2, 1.SL.2.4, 2.SL.1.2, K.L.3.5, K.L.3.6, 1.L.3.5, 1.L.3.6
Social Studies	SS.K.E.1.4, SS.K.G.1.1, SS.2.E.1.2
Physical Education	PE.1.L.2.8, PE.2.L.2.11

2. **Opener:** Have students repeat the "Plants Don't Eat" chant after the teacher.

Plants Don't Eat!	
(Teacher)	(Students Repeat)
Plants don't eat!	Plants don't eat!
Plants don't need to eat!	Plants don't need to eat!
Plants make their own food.	Plants make their own food.
We can't do it.	We can't do it.
We need plants.	We need plants.
Plants make their own food.	Plants make their own food.
And food for us, too!	And food for us, too!
Plants don't eat!	Plants don't eat!
Plants make their own food.	Plants make their own food.
And food for us, too!	And food for us, too!

3. **I do:** Explain to the class that during the next few activities they will be creating raps of their own based on gardens and healthy eating. With this activity they will practice creating 'wants and needs' raps by learning rhyming words. Post a T-chart of *MyPlate* foods and their rhyming partner words with *MyPlate* words on one side and rhyming partner words jumbled on the other side such as 'bread' rhymes with 'head' and 'fruit' rhymes with 'root.' Draw a line to match it with its rhyming partner.
4. Put up the *Wants and Needs Rap* template, and show an example of filling in the first two lines such as 'I want **candy** but I need **wheat bread**. I need to always use my **head**.' Describe how students will first pick junk food for the first line. Then they will find the matching rhyming partner word for the bold word to write on the second line (see template for more explanations). **Answers: Bread – Head; Berry – Merry, Celery – Belly.**
5. **We do:** Students think for 10 seconds of a pair of rhyming words they see on the T-chart. Students turn to their "shoulder" partner (or a partner nearest) and share the rhyme they found. Students then raise their hand to share with the teacher the rhyme they found. Teacher draws lines to the pairs as students share the rhymes.
6. **We do:** Part 2: Students think for 10 seconds on their own of a junk food to put on the next example. Students share with their partner. Students share with teacher. Students then think again for 10 seconds about which rhyming word fits on the second line based on their partner chart. Students share with shoulder partner. Students share with teacher.
7. **You do:** Students fill in their rap templates.
8. **Closing:** Students read/share their raps to the class. Class claps along.

Activity Two:

1. **Opener:** Share pictures of gardens and salads with students.
2. **We do:** Take the class on a walk in the garden and ask them to look for three colors, two smells and one unique touch (sensory or feeling) word. Provide an example of a sensory word – hard, soft, fuzzy, prickly, rough, smooth, warm, cold or moist. Have students record their words in their journals or notebooks and return to the classroom.
3. **I do:** Demonstrate how the *Sensing Garden Rap* template is completed with five words. This is similar to a Mad Libs game where you fill in verbs and adjectives.
4. **We do:** Have students share their first rap sentence from the template with their face partner or closest partner to them.
5. **You do:** Have students fill in Sensing Garden Rap template.
6. **You do:** Have students parade around the room with music playing, raps in hand. Stop the music and have students freeze in place, find the closest partner and share their rap. Repeat twice.

Extensions and Variations:

1. Have students make puppets to use in a puppet show in place of physical actions by themselves. The puppets can either represent themselves or the foods in the salad.
2. Have older students also working in the garden (middle school and/or high school students) assist the younger students to create chants/raps and dances in small groups.
3. Put on a school assembly for parents displaying the chants, raps, and dances. Include a tour of the school garden and a taste test party with foods made from the garden.

Evaluation Options:

1. Assess student participation in brainstorming and contribution for suitable words and in creating the rap/chant.
2. Have students practice the rap/chant they created until they can perform it well. Perform the rap/chant and dance for another class or parent group or record it. Assess student performance for speech, rhythm and accuracy.

3. Have students make a list of their wants versus what they actually need in a "T chart."

Resources:

Raps for Kids, My Word Wizard at www.mywordwizard.com/raps-for-kids.html

Cheers, Chants, Raps, and Poetry, Songs for Teaching, www.songsforteaching.com/chantsraps.htm

Rhyming Worksheets at www.education.com/worksheets/rhyming

Salad Rap

Sample Pre-Post Assessment

1. Name a food grown in your school garden that helps meet your needs:

2. Write a word to describe how that fruit or vegetable smells, feels or appears to you.

3. Name a fruit or vegetable not grown in the garden that you would like to try.

4. What is the difference between a want and a need?

5. Who makes food from air, water and sunlight – plants or people?

Wants and Needs Rap

By: _____

I want _____ but I need wheat bread.
junk food word

I need to always use my _____.
rhyming partner word

I want _____ but I need berries.
junk food word

That way I can be _____.
rhyming partner word

I want _____ but I need peanut butter and celery.
junk food word

Which fills up my happy _____.
rhyming partner word

Sensing Garden Rap

By: _____

The _____ garden was so pretty.
color

All of the _____ vegetables could feed a city!
smell

The _____ lettuce was so crisp.
touch

It's no wonder junk food won't be missed.

_____ and _____veggies are great ingredients,
color smell

for a _____ salad, but that's no secret.
color

Vegetable Relay

Subjects Taught: Nutrition, Physical Education

Grade Levels: Kindergarten - 2nd Grade

Brief Description: Students will match vegetable seeds with the vegetable and learn a basic food fact about each then participate in a relay.

Objectives: Students will:

1. Identify various vegetable and fruit seeds with the fruits or vegetables they will produce.
2. Match seeds with vegetables by participating in a relay.
3. Understand a basic food fact about each vegetable.

Life Skills: comparing, following directions, identifying, listening, matching

Materials Needed:

- Common fruit and vegetable seeds: watermelon, carrot, cantaloupe, collard greens, beets, radish, tomato, peas, pepper, lettuce, squash, sweet corn, and onion. (Others may be used, pumpkin, beans but nutritional basics will need to be researched). Each student will need one seed each of the large seeds (watermelon, squash, sweet corn) and several seeds of each small vegetables seeds (carrot, beets, radish, tomato, pepper, lettuce and onion) to tape or glue to their worksheet.
- Three sets of seed cards, laminated and cut apart plus extra sweet corn seeds.
- Pictures of the above named vegetables glued onto paper lunch bags or seed packets clipped on.
- Copies of *Seed Connections/Food Facts Student Worksheet* - one per student.
- Copies of the *Quiz: Seed Connections/Food Facts* - one per student.

Time:

Activity One: 45 minutes
Activity Two: 45 minutes

Preparation:

1. Gather materials – seeds indicated, make copies of student handouts and quiz, pictures of fruits and vegetables that can be posted during the relay.
2. Create three sets of seed cards (more if the class size is large) by printing or copying three copies of the seed card master, gluing seeds onto the correct cell of the seed card masters, letting them dry, laminating the three completed seed cards, and cutting apart each set into separate cards – each set is for one team. Once these are created they can be saved and reused each year. If a laminating machine is not available, self laminating or clear contact film can be used.
3. Make copies of the student handouts and quiz – one per student.
4. Set up the relay for the second session. Tape or glue fruit or vegetable pictures or clip seed packets onto paper lunch bags. Stand lunch bags on one end of the relay field

Florida Standards Met At-A-Glance

National Next Generation Science	1-LS3-1, 2-LS4-1, 3-LS1-1, 3-LS3-1
English/Language Arts	K.W.1.2, K.W.3.7, K.W.3.8, 1.W.3.8, 2.W.3.8, K.SL.1.2, K.SL.1.3, 1.SL.1.2, 1.SL.1.3, 2.SL.1.2, K.L.3.5
Mathematics	K.MD.2.3
Physical Education	PE.K.C.1.2, PE.K.L.1.4, PE.K.L.2.4, PE.K.L.2.6, PE.K.M.1.13, PE.K.R.1.1, PE.1.C.1.2, PE.1.L.2.8, PE.1.R.1.3, PE.2.C.1.2, PE.2.L.2.11
Health	HE.K.B.3.2, HE.K.P.1.1

(room) equal distance apart, and make a starting line on the other end.

5. If you chose to use additional seeds not listed above, research a basic nutritional value for the students to be able to identify with the fruit or vegetable and provide added seeds or seed cards for the students.
6. Review information from the USDA National Agriculture Library for background information on the importance of vegetables and healthy eating.
7. Review information from the FDA Nutrition Information website for background information.

Vocabulary: fruit, nutritional value, relay, seeds, vegetable

Background Information:

Students will have the opportunity to actively identify and describe vegetables, seeds and their key values. Their skills will be tested by participating in an exciting relay race, activating them physically and challenging them mentally.

It is important to gather seeds from the list on the worksheet. These seeds have been selected as they each are unique enough to be distinguished among the others, while providing diversity in the vegetables and nutritional values.

It may seem challenging for very young students to learn what fruit a particular seed will produce, but these children will learn exactly this as they garden. The shape, color and size of seeds will become commonplace. As the garden grows and they learn to distinguish between plants and weeds they will also see how similar seeds may produce very different plants or very similar plants. Or the plants may appear different but flowers and fruit will be similar. Or the opposite may be true. The plants may appear similar but the fruit will be different. This will be a very early introduction to botanical classification and lead students to understand why groups of plants are classified as families.

After the activities, the remaining seeds can be used in the school garden.

Activity One:

1. **Opener:** Introduce the topic of vegetables and fruits. Provide a basic review of how eating fruits and vegetables is an important part of a healthy lifestyle, how they taste good, and how they are an important part of different cultures. (How could we have spaghetti or pizza without tomatoes?) and celebrations (What would Thanksgiving be without squash and pumpkin pie?) Describe the food groups and where vegetables and fruits fit in *MyPlate*.
2. **I do:** Show students all of the fruits and vegetable seeds from the *Seed Connections/Food Facts Student Worksheet* sheet and describe how each of them helps the human body individually. Place seeds on teacher's own larger version of a seed connection worksheet as she describes it.
3. **We do:** Teacher gives students a clue (i.e., "helps eyes"). Students think for 10 seconds about which fruit or vegetable this is. Students share this fruit or vegetable with their partners. Students raise their hand and share with teacher. (Repeat for all fruits and vegetables.)
4. **I do:** Teacher takes down her large *Seed Connections/Food Facts Student Worksheet*. Hand out the *Seed Connections/Food Facts Student Worksheet* - one per student. Each student gets a bag of all of the fruit and vegetable seeds (if seeds aren't available use pictures of seeds). Teacher holds up a *Seed Card* one at a time. Students must find this seed. Teacher then calls out a clue (i.e. helps eyes). Students must glue or tape this seed next to the fruit or vegetable that coincides with the clue. Repeat for all seeds.

Activity Two:

1. **Opener:** Students think for 10 seconds about one fruit or vegetable they learned about in the previous activity and how it helps the human body. Students share with a partner. Students share with the teacher.
2. **I do:** Teacher describes that categorizing involves grouping things based on how they are alike. One way to

categorize is by how something looks. Teacher describes how each student and his or her partner will get a bag of seeds that they learned about the previous activity. Students will have to categorize or group the seeds by looks. Teacher demonstrates by categorizing or moving all of the carrot seeds into one group and describing their similar features (size/color).

3. **We do:** In pairs of students with mixed abilities, students are given a bag of different seeds. Students must separate and categorize their seeds.
4. **I do:** Individually, each student chooses two seed groups to compare (i.e., carrots and collard greens). Students draw a Venn diagram. Using their *Seed Connections/Food Facts Student Worksheet* from the previous activity students label their Venn diagram. Students then draw or write one way their two seeds are alike and one way they are different.

Activity Three:

NOTE: This activity is best conducted outdoors, if possible. The goal of running in the relay should be to increase the students' heart rates but safely running between the starting line and the location of the vegetable images is important.

1. **Opener:** Discuss information about fruits and vegetables.
   a. "When do you like to eat _____?"
   b. "Do you like to eat _____ raw?"
   c. "Do you like to eat _____ cooked as_____?"
   d. "Do you like to eat _____ mixed into _____."
   e. "Is there a holiday or season when you eat this food?"
   f. "How does this food help your health?"
   g. "What flavor does this food have?" (sweet, sour, hot, spicy, bland, etc.)
2. **I do:** Show students the seeds they have been learning about the past two activities. Remind students to look at the seeds and how they match the fruit or vegetable.
3. **We do:** Play "I have, Who Has." Pass out a fruit or vegetable picture to half of your students and a seed picture to the other half of students. All students stand up in a circle. One student begins by saying " I have a picture of a _____ (fruit/vegetable). Who has my matching seed?" The person who has the matching seed raises their hand and shows everyone their seed picture. The pair of students sit down. Teacher selects the next fruit/vegetable student to say "I have a picture of a _____ (fruit or seed). Who has my seed?" And repeat the process until everyone is sitting down.
4. **You do:** Set up and conduct a vegetable relay –
   a. Students are divided into four teams (or divide your students into teams of equal groups). Teams stand in lines outside if possible.
   b. Opposite the four teams (25-75 feet away) place brown paper bags. There should be one bag per student on the team. (i.e. if you have three students per team then there are three paper bags at the opposite end for each team). On each paper bag glue a large picture of a fruit/vegetable.
   c. Each student is given a fruit or vegetable *Seed Card Master* that corresponds to one of their vegetable/fruit paper bag.
   d. Discuss rules with students: No crashing into each other. No pushing other students out of the way. The first person arriving at a bag shows the judge his or her seed first and the rest must wait in line.
   e. When "go" is called, students run to the opposite end, place their seed card in the correct vegetable/fruit bag and run back to their line. Once they have gone, students take a seat in their line. Once all students are sitting down, the teacher stops the game. The teacher checks the students' vegetable bags for accuracy.
5. **Closer:** Teacher asks the question "Why is physical exercise important to your health?" Students do "hand up-stand up-pair up" - Students stand up and put up their hand. Students walk around and find another person with his or her hand up. Student gives this person a high five and the two become a pair. Students then sit down and discuss the answer to the question.

Evaluation Options:

1. Have students complete the *Quiz: Seed Connections/Food Facts* by matching the fruit or vegetable to the corresponding concept on the right by drawing a line.
2. Assess for accuracy the seed placement on the worksheet.
3. Evaluate student accuracy and participation in the relay, which requires them to be active, work as a team, and accurately identify the seed.
4. Assess the accuracy of those students serving as judges.

Extensions or Variations:

1. Re-run the relay with the same rules but an addition — when the students place their seed card they have to tell the judge or teacher a food fact about their fruit or vegetable and the judge will have to approve the food fact before the seed card is placed. (Judges will have to make sure they remember the facts about their fruit or vegetable.)
2. Use different types of peppers (bell pepper, chili peppers, jalapeno peppers, Hungarian wax peppers) or tomatoes

(cherry tomatoes, heirloom tomato varieties, paste tomatoes, yellow tomatoes and slicing tomatoes) to show students how similar all of the seeds look from each species of plant. Compare the seed to the picture of the plant fruit on the seed packet. Ask them to speculate how all the seeds can look so similar and yet produce peppers and tomatoes so different from one another. Grow out the seeds and compare how the plants differ and how they are similar.

3. Give those students serving as judges an opportunity to run the relay and have other students serve as judges by switching roles and rerunning the relay on another day.
4. Have students identify the major nutrient provided by each of the fruits and vegetables for which they have seeds.
5. The relay activity can also be complete with the identification of the stages of seed germination as an extension to both this lesson as well as the lesson titled "Yo Seeds, Wake Up" from *Gardening for Grades*.
6. Sprout these seeds to grow plants for the garden, noting how the seeds germinate.

Resources:

Downloadable nutrition facts for fruits and vegetables from the Food & Drug Administration:
www.fda.gov/downloads/Food/GuidanceRegulations/ucm063477.pdf

USDA National Agriculture Library www.fnic.nal.usda.gov/dietary-guidance/fruits-veggies-more-matters-resources/fruit-and-veggie-pages

Credits:

www.pforlife.com/fruits-vegetables-their-benefits.html

Vegetable Relay

Sample Pre-Post Assessment

1. Why are fruits and vegetables good for you?

2. Should you eat fruits and vegetables every day?

3. Do different types of seeds make different plants?

4. Do different plants make different fruits or vegetables?

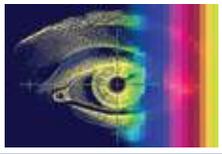
Seed Card Master

Watermelon	Carrot
Cantaloupe	Radish
Peas	Onion
Collard Greens	Peppers
Squash	Tomato

Seed Connections/Food Facts Student Worksheet

Name: _____

Why are fruits and vegetables good for you? The benefit of the fruit or vegetable is described next to it. Tape the seed of that plant next to the image of the fruit or vegetable.

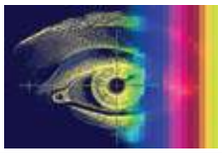
Watermelon 	⇨	Cool snack on a hot summer day, and promotes weight loss 
Carrot 	⇨	Helps eyesight 
Collard Greens 	⇨	Makes bones stronger 
Pepper 	⇨	Gives you energy to play and vitamin C Comes in a wide variety of colors 
Cantaloupe 	⇨	Vitamin A, wards off illness 
Radish 	⇨	Spices up a salad 
Tomato 	⇨	Good fresh on a sandwich or cooked into a sauce 
Squash 	⇨	Comes in a variety of sizes, shapes and colors 
Peas 	⇨	High in fiber 
Onion 	⇨	Flavors many foods, can make you cry when you slice it and lowers cholesterol 

Quiz: Seed Connections/Food Facts

Name: _____

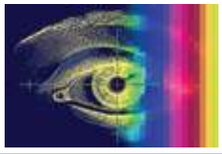
Why are fruits and vegetables good for you? Match the fruit or vegetable with its benefit.

Watermelon	
Carrot	
Collard Greens	
Pepper	
Cantaloupe	
Radish	
Tomato	
Squash	
Peas	
Onion	

Makes bones stronger	
Helps eyesight	
Vitamin A, wards off illness	
Good fresh on a sandwich or cooked into a sauce	
Cool snack on a hot summer day, and promotes weight loss	
Gives you energy to play and vitamin C Comes in a wide variety of colors	
High in fiber	
Flavors many foods, can make you cry when you slice it and lowers cholesterol	
Spices up a salad	
Comes in a variety of sizes, shapes and colors	

Answer Key: Seed Connections/Food Facts

Why are vegetables good for you? Match the vegetable with its benefit. Then tape the seed to the matching vegetable.

Watermelon 	Makes bones stronger 
Carrot 	Helps eyesight 
Collard Greens 	Vitamin A, wards off illness 
Pepper 	Good fresh on a sandwich or cooked into a sauce 
Cantaloupe 	Cool snack on a hot summer day, and promotes weight loss 
Radish 	Gives you energy to play and vitamin C Comes in a wide variety of colors 
Tomato 	High in fiber 
Squash 	Flavors many foods, can make you cry when you slice it and lowers cholesterol 
Peas 	Spices up a salad 
Onion 	Comes in a variety of sizes, shapes and colors 

Florida Citrus Salad

Try This Florida Recipe

Ingredients

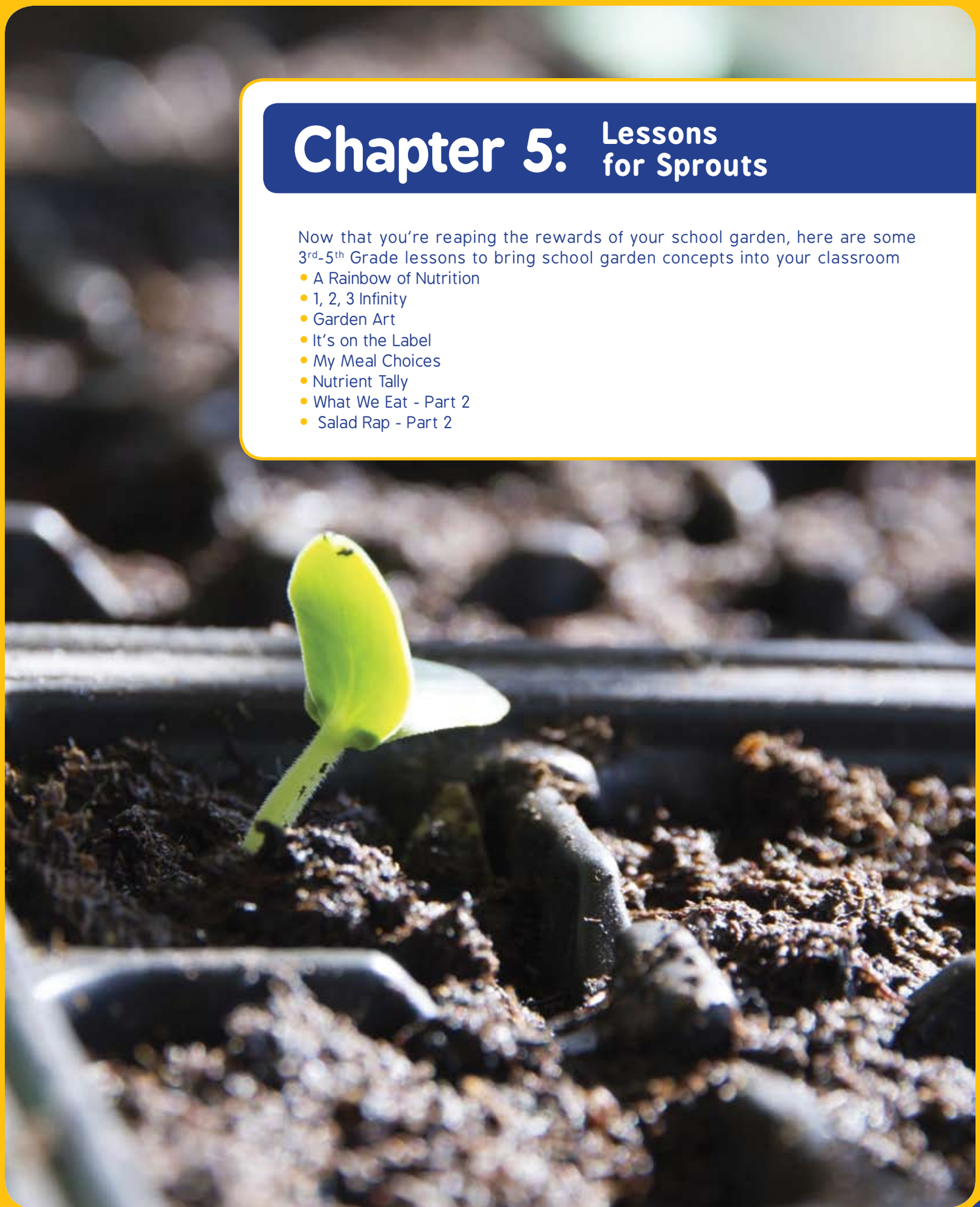
- 2 Florida oranges
- 1 Florida grapefruit
- 1 cup pineapple chunks

*You can substitute other Florida citrus for oranges and grapefruit, such as tangerines, lemons and limes.

Instructions

- Wash your hands with soap and water, then gather all your kitchen gear and ingredients and put them on a clean counter.
- Peel fruit and slice into juicy wedges.
- Combine fruits in a bowl and stir.
- Chill and serve.

Fresh from Florida



Chapter 5: Lessons for Sprouts

Now that you're reaping the rewards of your school garden, here are some 3rd-5th Grade lessons to bring school garden concepts into your classroom

- A Rainbow of Nutrition
- 1, 2, 3 Infinity
- Garden Art
- It's on the Label
- My Meal Choices
- Nutrient Tally
- What We Eat - Part 2
- Salad Rap - Part 2

A Rainbow of Nutrition

Subjects Taught: Science, Language Arts, Arts, Physical Education, Health

Grade Levels: 3rd - 5th Grade

Brief Description: Students will research foods made from plant families (with support as needed), identify family members and common nutrients and create artwork of one family group or a food made from that family.

Objectives: Students will:

1. Sort images of fruits and vegetables into plant families.
2. Select several choices from botanical groups of fruits and vegetables, identify foods made from that fruit or vegetable and find a photo of either the raw produce or food made from it.
3. Observe one fruit or vegetable, preferably grown in the school garden, and draw or write at least five characteristics in a science notebook.
4. Create a realistic art piece to showcase one of their produce or food choices.

Life Skills: creative thinking, evaluating, following directions, obtaining information, note taking, science process skills, scientific thinking, use of artistic supplies

Materials Needed:

- Fruits and vegetables preferably from the school garden
- Copies of the fruit and vegetable pictures cut into cards
- Fruits and vegetables, preferably from the school garden
- Computers with Internet access and color printers
- Watercolor paints or markers
- White drawing paper or watercolor paper
- Science tools (measuring tape, hand lens, forceps, etc.)
- Gloves (needed if class is going to eat fruit or vegetables after activity)
- Copies of *Nutrition in Common Student Handouts*

Time:

Preparation: 30-45 minutes
Five, 30 minute sessions

Preparation:

- Fruit and vegetable collection (live, models or images), preferably harvested from school garden
- Set up of markers or paints
- Collect cleaned, empty food containers and/or labels
- Print out images of *Family Food Cards*, cut them apart and laminate them for reuse
- Copy *Nutrition in Common Student Handouts*
- Plan for computer, Internet access and printer use

Vocabulary:

Names of fruits or vegetable as needed:
Allium family: chives, garlic, leeks, onions, scallions, shallots.
Lettuce (asteraceae) family: lettuce, sunflowers, romaine, Bibb lettuce, red leaf lettuce, oak leaf lettuce, green leaf lettuce.
Cabbage (brassica) family: cabbage, Brussels sprouts, broccoli, cauliflower, bok choy, radishes, mustard.
Gourd (cucurbit) family: cantaloupe, cucumber, pumpkin, watermelon, winter squash, zucchini.
Nightshade (solanaceae) family: eggplant, sweet peppers, hot peppers, potatoes, tomatillos, tomatoes.

Background Information:

Like people, plants have families and some of the members of those families may seem odd or a challenging fit. Yet, they have much in common because their genetics are similar, and they

Florida Standards Met At-A-Glance

National Next Generation Science	3-LA1-a, 4-LS1-a
English/Language Arts	3.RI.2.4, 4.RI.2.4, 4.RI.4.10, 5.RI.4.10, 3.W.3.7, 3.W.3.8, 4.W.3.7, 4.W.3.8, 5.W.3.7, 5.W.3.8
Physical Education	PE.3.L.2.5
Health	HE.3.B.1.4, HE.3.B.4.2, HE.4.B.1.4, HE.5.B.1.4
Science	SC.3.N.1.1, SC.3.P.8.3, SC.4.N.1.1, SC.4.L.17.2, SC.5.L.14.2

provide similar nutrients. It is fairly common knowledge that tomatoes are high in vitamin C. It is less well known that this is also true for the rest of their family - the Nightshade family, scientifically known as the Solanaceae (pronounced Sō-lə-'nā-she ee) family. This includes eggplant, sweet peppers, hot peppers, potatoes, and tomatillos along with tomatoes. Most adults know that citrus fruits all provide high amounts of vitamin C but it would be a challenge for most to identify the foods that give us zinc or B6. Why? We teach nutrition using food groups rather than nutrients.

This lesson begins to help students learn about nutrients from specific foods while at the same time appreciating the beauty and flavor of foods and perhaps developing an interest in exploring food preparation beyond a box, bag or a frozen package ready to microwave. It also helps students learn that while these plants may be members of the same extended family, each individual species has a wide variety of members in that family. Some examples include:

The Allium Family – Onions, garlic, shallots, scallions, chives and leeks.

The Solanaceae (or Nightshade) **Family**
Tomatoes – Tiny grape tomatoes, round cherry tomatoes, pear shaped cherry tomatoes, oval plum tomatoes, medium sized slicing tomatoes, or giant one to two pound sandwich tomatoes. They can be red, yellow, pinkish, purplish, green or striped.
Peppers – (in the same Nightshade Family) have an even greater assortment.

- Bell peppers are sweet and are green, red, yellow, orange, or purple.
- Jalapenos are two to three inches long, an inch in diameter, light green and are spicy with a slight heat.
- Pepperocini are about the same size with the same level of heat but a different flavor than jalapenos and are yellow in color.
- Hungarian peppers are six to seven inches long, one and a half inches in diameter are slightly hotter and yellow in color.
- Ancho chili peppers are four and a half to six and a half inches long, and turn bright red when ripe and are hot.
- Habanero peppers are even hotter, are short lived and dented in colors of yellow-orange, pink-orange or orange-red.
- Other types of peppers include cayenne, fireball, serrano, anaheim, banana, paprika, and bhut jolokia peppers. They range in size, shape, color and taste and are much hotter than a jalapeno.

The Cucurbits (or Gourd) **Family** - Pumpkins, winter squash, cucumbers, zucchini, cantaloupe, watermelon

The Asteraceae (or Lettuce) **Family** - Different types of lettuce that include romaine, Bibb, butter head, or leaf lettuce. Leaf lettuce comes in different varieties such as oak leaf, curly leaf, red leaf or green leaf.

The Brassica (or Cabbage) **Family** - Cabbage, broccoli, cauliflower, bok choy, Brussels sprouts, kale

The Grass (or Cereal Grains) **Family** - Wheat, oats, rye, rice, corn, barley

As you examine each family group, and in particular their seeds, flowers, and seedlings, the similarities will be apparent. Yet as with human families, fruit and vegetable families can be very different from one another. Specific Florida fruits and vegetables are a focus of the *Gardening for Grades* book. Please refer to it for additional information.

Family Characteristics:

Grass family: They have hollow stems called culms and their flowers are arranged in spikelets.
Allium family: They are perennial bulbs that produce a chemical compound that gives off an odor that can be offensive.
Lettuce (asteraceae) family: They have a characteristic inflorescence which is a cluster of flowers arranged on a stem. Most are herbaceous and their name is derived from the Greek term aster which means star.
Cabbage (brassica) family: Their flowers consist of four petals that resemble a cross. They are mostly herbaceous and contain phytochemicals that have anti-cancer properties.
Gourd (cucurbit) family: They are annual vines with large white or yellow flowers. Their stems are hairy and pentangular. They have tendrils that are present at 90 degrees to the leaf petiole at the node and their leaves are simple palmate lobed or palmate compound.
Nightshade (solanaceae) family: They are a flowering plant with a flower that resembles the sun and its rays.

Introduction

1. Draw a large rainbow on a poster board and ask the students to draw pictures of fruits and vegetables of the colors of the rainbow. You can assign each student a specific color or just allow the student to draw their favorite. Once they have finished drawing and coloring have them place their fruit or vegetable on the matching color of the rainbow.
2. Foods come in a rainbow of colors. Show a variety of fruit and vegetable baskets that are harvested from the school garden or show images of fruits and vegetables of all colors.
3. Ask: "What science process skills could we use to find out more information about our food item?"
4. Have students discuss science process skills. There are six basic science process skills: observation, communication, classification, measurement, inference, and prediction. (If not already posted in room, teacher may write on chart paper as students discuss.)
5. What senses will we use to observe? Discuss safety of using senses in science exploration, especially wafting/smelling differences.

Activity One:

1. Explain that like people, plants have families. Sometimes the members of a family may seem like they don't fit together, but once you examine them you will see that they are connected by many of the same traits. These food families often provide the same nutrients as well.
2. Take the *Family Food Cards*, mix them up and have students sort them into the groups that they believe represent the same family.
   a. Offer guidance as needed with questions to eliminate specific categories for confusing foods such as eggplant, melons, or potatoes such as;
      "Is it juicy or is it dry?"
      "Are they the same shape?"
      "Are the seeds visible or available? What do they look like?"
      "Where do you think it grows? Underground? On a vine? On a bushy plant?"
      "Does it look like any other produce?"
      "Are the visible leaves the same color?"
      "Are the visible leaves the same shape?"
      "What do the flowers look like?"
      "Have you eaten any of these vegetables? What did they taste like? What did they smell like when cooking?"
   b. If seeds for specific plants are available, allow students to see what that particular plant's seeds look like.
3. As students begin to complete the sort, begin a discussion to allow students to move food cards as needed. Ask students to describe how many of the foods in each group look similar. "What traits do they have in common?" As needed, offer support to direct the discussion toward the flowers or seeds related to each family of fruits or vegetables.
   a. There may be some that are difficult to place – potatoes and eggplants are examples. Show students the flowers of those plants and others from the solanaceae family.
   b. If all images are not able to be placed, share the link with students.

4. Once all the food cards are sorted correctly, explain that because these foods are families they provide many of the same nutrients. We are also learning that they also provide food.
   a. Ask: "How many of you like onions?" (It is likely that most students will say that they do not like onions.) Challenge them that they may like onions more than they know.
   b. Ask: "Is ketchup, pizza or spaghetti sauce anyone's favorite food?" All of these foods have onions in the ingredients and without onions they would not taste like ketchup, pizza or spaghetti sauce. Read food labels to confirm this.
   c. Review that onions, garlic, scallions, leeks and shallots all belong to the same family. Poll students to find out how many have eaten any of these foods before.
5. Students choose a fruit or vegetable from the school garden (or those discussed in activity one) that they wish to observe and research.
6. Using the Internet, students research a specific fruit or vegetable from the garden or food card to find an image of a dish made with this ingredient to print out.
   a. Have them complete the *Nutrition in Common Student Handout* for their food item and prepare to share the nutritional information.
   b. Good websites for students to use are Fruits: www.floridaplants.com/growing.htm; vegetables: www.growincrazyacres.com/Florida-Planting-Guide.php; USDA food gallery: http:www.ars.usda.gov/is/graphics/photos. The illustration category has food grouping information, and the USDA nutrient database.

Activity Two:

1. Using science tools, have students observe, record and sketch characteristics of the produce and food item. Have students share their work as they finish.
2. Have students create a still life, realistic drawing or painting of the fruit or vegetable and the dish in which it's used. (Have students share their artwork as they finish.)
3. Place completed items to dry and complete Internet research.
4. As each student gives their presentation of their artwork, research and Internet photos, have other students complete the chart on the *Nutrition in Common Student Handout*.
5. Discuss with students the nutrients that each group has in common. Ask how this influences the nutrients they receive based on their eating habits.

Evaluation Options:

1. Assess food family card sorting and cooperative work.
2. Assess student completion, accuracy, and thoroughness of drawing or writing at least five characteristics in the science notebook.
3. Assess student artwork for creativity and completeness.
4. Assess student completion of the *Nutrition in Common Student Handout*.

Extensions and Variations:

1. After the students have completed their artwork on their food item, have them create a collage or poster of all the different things their food item is made into. For example, if they had tomato they could put spaghetti or pizza on their collage.
2. Have students identify what a serving size for their food is and where their produce or finished food item fits in the *MyPlate* graphic organizer on page 58. Be sure to indicate child or adult size portions.
3. Hold a "Rainbow of Nutrition Food Fest" to showcase student artwork and healthy eating choices. If you have ripe fruits and vegetables from your garden, you could also provide samples for taste testing.
4. Ask students to research berries and determine whether they are all in the same family or not. Discuss the similarities and differences of the berries and the nutritional value of several varieties.

Resources:

Fruits: www.floridaplants.com/growing.htm

Vegetables: www.growincrazyacres.com/Florida-Planting-Guide.php

USDA food gallery: www.ars.usda.gov/is/graphics/photos
The illustration category has food grouping information.

CPalms: www.cpalms.org/RESOURCES/URLresourcebar.aspx?ResourceID=Lfxk/75OVn0=D

CPalms: www.cpalms.org/Resources/PublicPreviewResourceCollection.aspx?ResourceCollectionId=1

Rainbow of Nutrition

Sample Pre-Post Assessment

1. Which of these foods are in the same family of plants: tomato, pepper, onion, wheat, pumpkin, cabbage, potato, eggplant, lettuce? Why?

2. What is the major nutrient of foods from winter squash, cantaloupes, and watermelons?

3. Which of the vegetables listed above are high in Vitamin C?

Allium Family

Food Cards

Onions	Garlic
	
Chives	**Leeks**
	
Shallots	**Scallions**
	

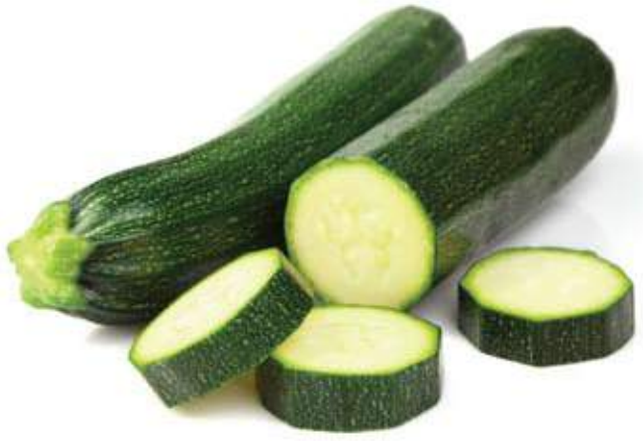
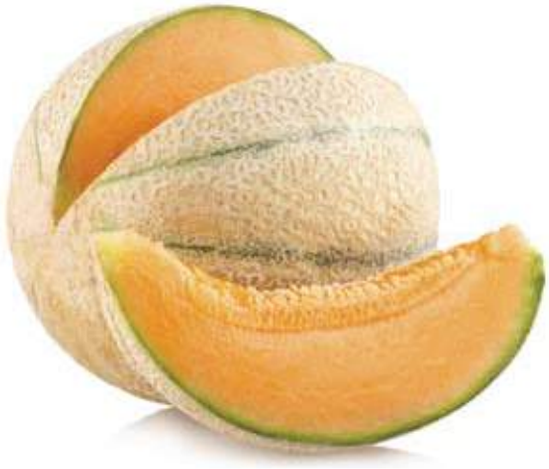
Nightshade Family (Solanaceae)

Food Cards

Tomatoes	Sweet Peppers
	
Hot Peppers	**Eggplant**
	
Potatoes	**Tomatillo**
	

Gourd Family (Cucurbits)

Food Cards

Pumpkins	Winter Squash
	
Cucumbers	**Zucchini**
	
Cantaloupe	**Watermelon**
	

Lettuce Family (Asteraceae)

Food Cards

Iceberg Lettuce	Bibb Lettuce
	
Romaine Lettuce	**Green Leaf Lettuce**
	
Oak Leaf Lettuce	**Red Leaf Lettuce**
	

Cabbage Family (Brassica)

Food Cards

Cabbage	Broccoli
	
Cauliflower	**Bok Choy**
	
Brussels Sprouts	**Kale**
	

Grass Family (Cereal Grains)

Food Cards

Wheat	Oats
	
Rye	**Rice**
	
Corn	**Barley**
	

Solanaceae Flowers

Food Cards

Typical Nightshade Flower	Tomato Flower
	
Potato Flower	**Eggplant Flower**
	
Sweet Pepper Flower	**Tomatillo Flower**
	

Nutrition in Common

Name _____

STUDENT HANDOUT

Family of Foods	Choices	Food Example	Nutrients, Health Benefits, Plus	Find a Picture Online
Allium Family: Onions Garlic Chives Leeks Shallots Scallions				
Solanaceae Family: Tomatoes Chili Peppers Sweet Peppers Potatoes Eggplant Tomatillo				
Gourd Family (Cucurbit): Pumpkin Winter Squash Zucchini Cucumber Cantaloupe Watermelon				

Nutrition in Common

Name _____

STUDENT HANDOUT

Family of Foods	Choices	Food Example	Nutrients, Health Benefits, Plus	Find a Picture Online
Cabbage Family (Brassica): Cabbage Broccoli Cauliflower Brussels Sprouts Bok Choy Kale				
Lettuce (Asteraceae Family): Iceberg Lettuce Bibb Lettuce Romaine Lettuce Red Leaf Lettuce Green Leaf Lettuce Oak Leaf Lettuce				
Cereal Grains from the Grass Family: Wheat Rye Rice Corn Barley Oats				

Nutrition in Common

Name: Answer Key

Family of Foods	Choices	Food Example	Nutrients, Health Benefits, Plus	Find a Picture Online
Allium Family: Onions Garlic Chives Leeks Shallots Scallions	Onions Garlic Chives Leeks Shallots Scallions	Soups, salads, Chinese food, ketchup, fajitas, spaghetti and pizza sauce As a baked potato topping with sour cream, as a garnish Soup Italian foods On vegetable trays, soups, salads	High in Vitamin C Anti-bacterial Antioxidants Lowers bad cholesterol Carbohydrates Fiber	
Solanaceae Family: Tomatoes Chili Peppers Sweet Peppers Potatoes Eggplant Tomatillo	Tomatoes Chili Peppers Sweet Peppers Potatoes Eggplant Tomatillo	Soups, spaghetti sauce, pizza sauce, salads, chili, sandwiches, ketchup Tex-Mex food, spicy Chinese food, Hot sauce, hot chicken wings, pepper flakes, Chili, fajitas, sweet pickles, in fresh vegetable crudites, stuffed peppers Mashed, boiled, baked, scalloped, French fries, tater tots, salads, soups Eggplant parmesan, ratatouille, babaganoush Salsa verde, enchilada suizas	Carbohydrates High in Vitamin C Anti-oxidants Minerals Fiber Flavor	
Gourd Family (Cucurbit): Pumpkin Winter Squash Zucchini Cucumber Cantaloupe Watermelon	Pumpkins Winter Squash Cucumbers Zucchini Cantaloupe Watermelon	Pumpkin pie, pumpkin bread, muffins Squash, pumpkin pie Salads, sliced, pickles, relish, tartar sauce, Thousand Island salad dressing Bread, pickled, steamed Sliced, fruit salad	Vitamin A Carbohydrates Fiber Anti-oxidants	

Nutrition in Common

Name: Answer Key

Family of Foods	Choices	Food Example	Nutrients, Health Benefits, Plus	Find a Picture Online
Cabbage Family (Brassica): Cabbage Broccoli Cauliflower Brussels Sprouts Bok Choy Kale	Cabbage Broccoli Cauliflower Brussels Sprouts Bok Choy Kale	All steamed or in stir fry	Vitamin C B Vitamins Vitamin K Magnesium Calcium Copper Potassium Iron Manganese Phosphorous	
Lettuce (Asteraceae Family): Iceberg Lettuce Bibb Lettuce Romaine Lettuce Red Leaf Lettuce Green Leaf Lettuce Oak Leaf Lettuce		In salads	Fiber Vitamin A Vitamin K B vitamins Vitamin C Iron Calcium Magnesium Potassium	
Cereal Grains from the Grass Family: Wheat Rye Rice Corn Barley Oats	Wheat Rye Rice Corn Barley Oats	Breads, pastas, cakes, cookies, cereals, tortillas, crackers Rye bread, pumpernickel bread, rye crackers Chinese food, Spanish rice, rice cakes, baby food, soups Tortillas, corn chips, breakfast cereals, soups, corn bread, corn muffins Soups, tea, vegetarian dishes Oatmeal, oatmeal bread, oatmeal cookies, granola, granola bars	Carbohydrates Protein High in B vitamins Fiber in whole grains Oils in whole grains	

1, 2, 3 Infinity?

Subjects Taught: Science, Nutrition, Language Arts

Grade Levels: 3rd - 5th Grade

Brief Description: Connecting annuals, biennials, and perennials to the foods we eat helps students understand the nutrients those foods provide us and why the plants contain those nutrients. The focus will be on how plants store food and why.

Objectives: Students will:

1. Define annual, biennial, and perennial.
2. Identify plants for each category - annual, biennial, and perennial.
3. Describe how, where and why plants store food.
4. Link nutrients obtained from plant foods to food storage in that plant.
5. Set a personal goal to eat more fruits and vegetables.

Life Skills: brainstorming, classifying, comparing similarities and differences, investigating, making decisions, observing, researching, setting goals, sorting

Materials Needed:

- Lima bean seeds
- Peanuts (alternative to avoid peanut allergy – sunflower seeds)
- Computers with Internet access
- 3" x 5" cards, Post It notes, small paper squares or electronic text boxes that can be stored and reused.
- Writing materials

Time:

Introduction: 1 hour unless photosynthesis has not been taught
Activity One: 45 minutes to one hour
Activity Two: 30-45 minutes
Activity Three: 45 minutes plus time for research
Summary: 10 minutes

Preparation:

If photosynthesis has not been taught please see "We're the Producers" in *Gardening for Grades* and/or "Gifts from the Sun" in *Project Food, Land & People* and teach photosynthesis so the students understand how plants make food from sunlight and elements in nature.

Vocabulary:

Annual, biennial, consumer, energy, perennial, producer, tuber

Background Information:

Annual, biennial, perennial, or one, two, three, infinity? What type of a plant are we eating and what does that have to do with nutrition? The type of plant and its life cycle has a huge impact on the nutrients we obtain. An annual plant lives one complete cycle in one year or more precisely one growing season – most often a few months. A biennial lives a complete lifecycle within two years or more precisely two growing seasons with a dormant period between the two growing seasons. A perennial lives for many years. The type of life cycle influences or controls the manner in which the plant stores food (energy). The mechanism for food storage determines the nutrients the food provides.

Florida Standards Met At-A-Glance

National Next Generation Science	3-LS1-1, 4-LS1-1, 5-PS3-1
English/Language Arts	3.RI.1.3, 3.RI.4.10, 4.RI.1.3, 4.RI.2.4, 4.RI.4.10, 5.RI.1.1, 5.RI.1.3, 5.RI.3.7, 5.RI.3.9, 5.RI.4.10, 3.W.3.7, 3.W.3.8, 4.W.3.7, 4.W.3.8, 4.W.3.9, 5.W.3.7, 5.W.3.8, 5.W.3.9, 3.SL.2.4, 4.SL.2.4, 5.SL.1.1, 5.SL.1.2, 5.SL.2.4, 3.L.3.6, 4.L.3.6, 5.L.3.6
Health	HE.4.B.3.5, HE.4.C.1.1, HE.5.B.4.1, HE.5.C.1.1
Science	SC.3.N.1.1, SC.3.L.17.1, SC.L.17.2, SC.4.N.1.1, SC.4.N.1.2, SC.4.L.16.4, SC.4.L.17.2, SC.4.14.2, SC.5.L.14.2

Annuals are generally grown from seeds and we often eat the resulting seeds as food. Seeds from annuals that are made into foods contain lipids (fats and oils), starch, protein, vitamins and minerals – all to feed the growing seedling. In fact, during milling, the wheat germ is separated from wheat (annual or biennial) because of the oil content. The oils are delicate and will go rancid once the wheat is crushed. So the germ is removed and stored in cooler temperatures to prevent spoiling and the milled flour can remain in storage longer. Other foods grown from annual seeds are harvested for vegetative plant parts that contain a lot of cellulose, which humans cannot digest so it provides fiber for the diet (cauliflower, broccoli, and the leaves of lettuce). But those plant parts are also rich in vitamins, minerals and phytonutrients. Some annual plants also produce fruits that contain seeds but the food we eat comes from the seed packet and the seed is only incidental to us. These annuals contain sugars and starches (cantaloupes, watermelon, and winter squash).

Foods from biennials are often not the fruit (seed) but the vegetative part of the plant that holds the food stored by the plant to initiate the second season's growth. These are often starchy roots, starchy leaves, starchy modified leaves (bulbs), starchy modified stems (tubers) and so provide us with carbohydrates. Because they have the food the plants need to re-grow, they also contain vitamins and minerals the plant will need to re-grow.

One would not expect to eat the stem or stalk of most perennials because they are woody trees and shrubs. Yet, asparagus (the stem of a perennial) fresh from the garden in spring is a delight and very nutritious and rhubarb adds a tangy jolt to desserts early in the growing season. Most perennials are responsible for the fruits we consume (apples, oranges etc.) rather than vegetative parts. To spread the seeds the fruits contain, they often come in a sweet, enticing package that animals love to eat. These fruits provide sugars and cellulose (fiber) to our diet along with the vitamins and minerals we need. Or they may be nuts that are rich in healthy oils. The oils in nuts have the same role as the oils in annual seeds – germination for the new plant. But these seeds are larger and have more oil because their germination is tougher; they have to break through that woody shell in most cases. We also take advantage of the transport of sugars in deciduous trees (sugar maple) or stem storage in grasses (sugar cane) to produce sweeteners.

Introduction

1. Ask the students: "How do plants make and store food?" Review photosynthesis.
2. Review the information in "What We Eat - Part 2" about what parts of the plant we eat because that is where plants store food.
3. Break the students up into pairs and ask each pair to brainstorm and/or research as many raw foods as they can think of that we eat or with which we make a beverage. Give them categories: leaves, stems, roots, fruit, seeds, nuts, tubers, bulbs, seeds pods, flowers, etc. Have them start with the foods being grown in the school garden but move beyond that.
4. On 3"x5" cards, Post It® Notes, small, equal-sized paper, or electronic text boxes, have students write their category of plant part and item of raw food.
5. Use Teacher Resource on page 104 as a guide when completing Activities One, Two and Three.

As a sample their initial list may look like this:	
Leaves	Lettuce, cabbage, spinach, parsley, endive, tea
Stems	Asparagus, celery, sugarcane, bamboo shoots
Roots	Carrots, beets, sugar beets, radish
Fruit	Apples, oranges, bananas, mangos, kiwi fruit, grapes, avocados
Seeds	Lima beans, peas, sweet corn, wheat, oats
Seed Pods	Sugar pea pods, green beans
Nuts	Walnuts, peanuts, pistachios, pecans, coconuts, cashews
Tubers	Potatoes, water chestnuts, jicama, jerusalem artichokes, yams
Bulbs	Onions, garlic, scallions
Flowers	Cauliflower, broccoli, artichokes

6. Make a master list from their input in a visual place or make sure it is available for frequent access electronically.
7. Explain that while some of these categories may be correct, others are not. This lesson will explore where and why plants store food, how that determines nutrients that we get from food, and how that relates to the plant's life cycle. (Keep the list posted as you proceed with the lesson. Eventually, you will reorganize it with only leaves, stem, roots, flowers, and fruits as the headings. But do not share that with students yet.)

Activity One:

1. Identify the stages of a plant's life cycle (germination, growth, reproduction, death).
2. Ask students what people and animals do if it gets too cold or too hot and dry to live outdoors. *(People live inside with heat or air conditioning. Animals grow heavy coats, find shelter, move into hibernation, or migrate south in the winter. Animals shed heavy coats, wallow in mud, travel to cooler climates, find shade, drink more water, etc in hot weather.)* Ask:
   "What do plants do if it freezes for long periods of time or becomes too hot and dry to live? They can't travel north or south. They cannot move to other locations to find shelter or shade. Plants cannot move to seek water or take in water that is unavailable. Plants cannot hibernate." *(Plants have adapted in other ways. Plants can't hibernate but some do go dormant, for example.)*
3. Ask the students if they know what an annual is. Give them clues until they can determine what it means.
   a. Clue 1: "The root of annual is the Latin word "annum" or "annus" meaning "year."
   b. Clue 2: "It refers to a type of plant."
   c. Clue 3: "It involves the life cycle of that type of plant."
   d. Clue 4: "An annual plant is a plant that lives its whole life within a _____."

4. Explain that for annual plants all of those stages are complete within one growing season which is one year or less. Some annual plants have longer life cycles than others but it always take place within one growing season. Annuals only grow when the conditions are right. They don't try to germinate and grow during the winter freezes or when there is not water or it is too hot. For example, lettuce will not germinate once the soil temperature exceeds 75° Fahrenheit.
5. Ask: "Which of the plants on the list (developed in the introduction) are grown as annuals?"
   Grains: wheat, corn, oats, barley, rye, buckwheat, rice, quinoa, etc.
   Seeds and seed pods consumed as vegetables: peas, green beans, lima beans, yellow snap beans, sweet corn, sugar pea pods, kidney beans, navy beans, black-eyed peas, etc.
   Fruits grown from seeds: Cantaloupe, watermelon, cucumbers, summer squash, winter squash, zucchini, eggplant, tomatoes, peppers
   Flowers: broccoli and cauliflower
6. Place a capital (A) next to each on the list to note that they are annuals.
7. Ask what they all have in common. Is there anything? *(They are all planted each year from seeds and the seeds can be found in seed catalogs or stores for purchase to plant in the spring.)*
8. State, "So, we have established that we grow annuals from seed every year and harvest the botanical fruits within a year regardless if they are eaten as fruits or vegetables. But the nutrition that we get depends on what part of the plant we actually eat."
   Ask:
   "What would the seed need to germinate – to break through the hard seed coat, push through the soil, grow several inches, spread leaves to reach the sun, grow a root to reach moisture and minerals?" *(It would need energy.)*
   (As the students grow seedlings for the garden compare the size of the seed to the size of the seedling.)
   "Where will the seedling get energy?" *(from inside the seed)*
   "Where inside the seed?" *(Starch and lipids [fats and oils])*
9. Dissect a large seed such as a lima bean to view the starch and crush a peanut on brown paper to see evidence of the oil. (If there are students with severe peanut allergies in the class, sunflower seed is a good alternative.) Explain that fats and oils contain two-and-a-quarter (4 calories versus 9 calories per gram) times the energy of starch which is a carbohydrate.

10. Ask: "Other than energy what will the seed need to germinate before it can start making its own food as a small plant?" *(Protein and vitamins and minerals to build the structure of the new plant.)*
    a. Explain further that the seed also has a hard seed coat to protect it and as we eat it that seed coat provides fiber if we eat whole grains.
    b. Also explain that the seed coat is known as bran and it contains most of the vitamins and minerals. That is why eating whole grains rather than polished or processed grains is so important.
    c. Note: If students include wheat on the list, identify it as spring wheat or winter wheat. Spring wheat is planted in the spring and is an annual. Winter wheat is planted in the fall, overwinters and re-grows in the spring and is a biennial.
11. Question whether all of the annuals we consume are in the form of seeds. (No) Ask:
    "How else do we eat annuals?" *(We eat them early before seeds are fully formed or when they are still sweet before the sugars turn to starch – green beans, yellow snap beans, peas, snow peas, sweet corn. Or lima beans, after the starch is formed but before they dry down.)*
    "Is there any other way we eat annuals?" *(We eat them as fruit, with the sweet or savory package that holds the seeds.)*
    "What is the purpose of the package that holds the seed? Why does the plant make it?" *(It protects the seed so it can ripen. It encourages animals to eat it [the fruit is digested but the seed coat prevents the seed from being digested] and spread the seed in their manure as they move around so the seed is distributed.)*
    "Is there any other purpose for the seed package?" *(It provides nutrients and moisture to the germinating seed if left to rot naturally. This helps the seed to grow while it is still fragile.)*
    "So what nutrients might the fruit contain?" *(Most fruits contain carbohydrates such as sugars, starch and cellulose, along with vitamins and minerals. Cellulose is a carbohydrate that we cannot digest so it gives us fiber.)*
12. Ask: "Might there be one more way we eat annuals?" *(Immature Flowers – broccoli, cauliflower)* Explain that because these are immature, they are primarily water, cellulose, vitamins and minerals so they provide fiber, vitamins and minerals to us nutritionally.
    The oddities – *(There are other plants that we grow as annuals but do not eat either the seed or fruit so students would not recognize them readily as annuals one is lettuce and a second is spinach)* Place an (A) next to both and explain that we harvest leaf lettuce, head lettuce and spinach before it bolts flowers, and sets seed because when it becomes bitter. Like flowers, these leaf crops are the vegetative part of the flower and provide mostly water, fiber, and small amounts of vitamins and minerals. (Potatoes are another oddity and we will discuss them after the lesson on biennials and perennials.)
    a. So, the category of flowers and the broccoli and cauliflower listed under that heading are correct. Place an (A) after each to indicate that they are annuals.
    b. However, seeds, seed pods, and fruits are all the botanical fruit of the plant. So, we need to put them under the heading of fruits. (An overarching heading of Botanical Fruits can be used in its place and the fruits, seeds, and seed pod headings can be used as subheadings if that makes it clearer to students.)
    c. Place an (A) next to the annuals as indicated in the Answer Key of this lesson.

Activity Two:

1. Ask the students if they know what a biennial is. Share that the prefix bi- means two, and the root of the word goes back once again to the Latin for year, although it is harder to see than the word annual is. Share that biennial is a plant that completes its life cycle within two-years.
2. Share that in order to survive from one year to another, the plant has to store food. This is to survive either winter freezing in temperate climates or a dry season that occurs in most tropical climates. So the top of the plant dies back and the food stored somewhere in the plant is used to rejuvenate the plant.
3. Have the students divide into teams of two and ask them to brainstorm and research where plants store food, share what that food might be for the plant and how that effects the nutrients we receive from foods. *(Plants can store food in leaves, roots, stems and that stored food is mainly carbohydrates – sugars and starches.)*
   The University of Florida Extension has an excellent website for student research by category at www.edis.ifas.ufl.edu/topic_vegetables_by_type as a place to begin.
4. Have each group identify which vegetables are biennials *(beets, Brussels sprouts, cabbage, carrots, celery, chard, collard greens, endive, kale, kohlrabi, leeks, onions, parsley, parsnip, rutabaga, salsify, and turnips)*.
   The oddities – In warm climates, cauliflower and broccoli behave as biennials because they need cool weather to initiate blooming.
5. State: "So, these plants take two years to germinate, grow, reproduce, and die." Ask:
   "Do we eat the seeds of these plants? *(Mainly no, we eat the stored food. We do eat celery seed for flavoring in pickles and sometimes in cole slaw.)*

"So, when do we pick these vegetables?" *(Before they flower and develop seed. We harvest them at the end of the first growing season. So we actually grow biennials as annuals but we harvest the vegetative storage portion of the crop.)*

6. Have the students place a (B) next to the biennials on the list. See below:
7. What have students learned about how these plants store food, what that means to the structures and to human nutrition? Should any changes be made to the list? *(All of the bulbs are really modified leaves and should be moved under that heading.)*

Activity Three:

1. Are the rest of the fruits and vegetables on the list perennials? Ask the students what they believe the word perennials means? *(Again, it comes from Latin words "per" meaning through and "annum" or "annus" meaning year.)* So perennial in Latin means through the years and it means that these plants live through the years or for many years.
2. Explain that the title of this lesson is 1, 2, 3 Infinity? And this is what the title means
   1 for annuals that live one year or one growing season.
   2 for biennials that live two years or two growing season.
   3 for perennials that live three or more years or growing seasons.
   But infinity? Can anything live forever: Probably not forever, but scientists are always looking for the oldest plants and animals living on the earth. How long can a plant live?
3. Have the students research what the oldest living plants are on the planet, where they are, what their climate is like, and how they manage to survive. Each student should provide a list of three plants that they believe to be the oldest and compete for the oldest. Students should provide information sources to document the credibility of the claim.

   Possibilities include:
   - *A Mediterranean Sea grass is believed to be at least 100,000 years old.*
   - *The oldest known plant clone is the King's Holly (Lomatia) of Tasmania estimated by scientists to be 43,000 years old.*
   - *There are two shrubs competing for the oldest living shrub. One group claims that it is a Box Huckleberry in Pennsylvania estimated to be 13,000 years old but verification is still underway. Others believe it is a creosote bush in the Mojave Desert of the United States estimated by a botanist to be more than 11,700 years old.*
   - *The oldest living spruce tree is now believed to be a spruce tree in Sweden that is 9,550 years old.*
   - *A Great Basin Bristlecone Pine tree known as Methuselah in California is estimated to be 4,846 years old whose age was scientifically verified by crossdating a core sampling in 1957. It was still living as of 2014. In 2013, another Bristlecone tree located in the same general area was discovered and is estimated to be 5,065 years old.*
4. Ask the students to report their findings and compete for oldest living perennial.
5. Discuss with students how these perennials survive; how those capabilities reflect perennials grown for food; and why this has meaning to the nutrition we receive from those foods. Perennials store food to survive times when they cannot obtain water, nutrients or undergo photosynthesis. That stored food might be found in sap that can be converted to syrup or sugars (maple syrup, sugarcane). Some of those perennials survive by cloning themselves. Scientists are proving that the longest living plants are often clones of the original plant that keeps recreating itself, vegetatively.
6. Explain that the perennial plant may be a tree that produces seed each year in the form of a fruit or nut crop. Fruits provide a support structure for the seed (sugars, starches) or they contain starches, protein and a lot of oils just as other seeds do to facilitate germination (walnuts, pecans, avocados). In the case of artichokes, we harvest the not too attractive flower in its immature stage.
   Plants that reproduce with tubers or rhizomes such as potatoes contain stored food (starch, vitamins and minerals) to fuel the growth of a genetically identical plant. There are tubers that are modified stems (potatoes) and there are tubers that are modified roots (sweet potatoes). So those categories need to be shifted – see chart on page 104.

Potatoes are **the oddity** for this group of plants. They do complete a life cycle of an annual by producing seeds within a single growing season. But they also produce tubers (modified stems) that will grow into an identical clone of the parent plant as perennials do. However, there is more to it. We do not reproduce potatoes by seeds but by potato pieces known as seed potatoes. And we do not consume the fruit of the potatoes – it is poisonous. So, although we grow potatoes as annuals, they are placed here to acknowledge that they do not fit easily in a single category. Jicama is in the same category producing seeds and tubers after the first growing season although it may take the full year to do so. The seeds of the jicama are also poisonous but new plants are grown from seeds.

Of course, as with all food from plants, perennials provide vitamins and minerals and fiber.

7. Have students complete the listing by adding a (P) after the perennials and giving potatoes and jicama both (A&P).

Summary Activity:

1. Hold a class discussion summarizing what the class has learned and what impact this has on their health. Use these questions to discuss:
   a. "Why should we eat vegetables? How does eating vegetables strengthen your health?" *(Various vegetables provide a nice variety of vitamins and minerals needed for bodily functions.)*
   b. "Why should we eat fruits? How does eating fruits improve your health?" *(Various fruits provide a nice variety of vitamins and minerals needed for bodily functions.)*
   c. "Why should we eat a **variety** of fruits and vegetables? How does that affect the nutrients we get?" *(Different nutrients are provided by each fruit or vegetable and are provided in varying amounts. An assortment of fruits and vegetables provides the whole spectrum of nutrients.)*
   d. "What are some potential problems or health concerns that could arise if you do not get a good mixture of different fruits and vegetables on a weekly basis?" *(Short term impacts will center around students not performing at optimal levels. Long term impacts are far more serious and lasting. Deficiency diseases can effect teeth, gums, skin, bones, immune systems, eyesight, blood and the heart.)*
   e. "Why is it important to eat whole grains and not just refined foods?" *(Refined grains are missing the outer husk of the seed or bran. Much of the fiber, vitamins and nutrients are found in this part of the seed. Refined grains lack those nutrients.)*
   f. "How will learning this information change the choices you make? If so, why? If not, why not? Will you be willing to try new vegetables? If so, why? If not, why not?"
2. Ask each student to write down a specific goal about eating new fruits and vegetables – what they are going to try, the serving size, the number of servings, how often and how will this will help them meet their nutritional needs. Ask each student to turn in their goals to you and report back when they have met their goals.

Evaluation Options:

1. Evaluate student research cooperation and participation.
2. In pairs, have students create a poem, chant or rap using what they have learned to categorize plants, the plant part used for food, and the nutrients provided.
3. Use the quiz included in this lesson.
4. When students have met the goal set in the summary activity give him or her an 'A' for the assignment. Have them then write a letter of congratulations for this achievement.
5. Have students create food webs that include annuals, biennials, and perennials, and the animals (including humans) that eat foods from each of these.

Extensions and Variations:

1. Have students add pictures of each fruit or vegetable as they research.
2. Have students create a meal plan including one annual, one biennial and one perennial fruit or vegetable in a meal every day for a week without repeating any item. So, this would include at least 7 annuals, 7 biennials, and 7 perennials for the week without repetition.
3. Include parents in the planning so they include more fruits and vegetables in family meals.
4. Have students make a map of the grocery store where their family shops and identify where each food group is located. Discuss what the maps make clear to the students. *(Fruits, vegetables, and dairy products are found on the outside of the store while processed and refined products,*

snack foods, sweets, and other non-food items are found inside the center of the store.) Discuss how this knowledge can help plan shopping trips to consume more whole foods and fewer refined foods.

5. Have students research and write about the origin of selected fruits and vegetables and how these influence the culture of that area, nutritional deficiencies that may have been issues and how the climate of that area influenced whether the foods eaten were annuals, biennials, and perennials.
6. USDA has a Fruit and Vegetable Challenge Activity kit that encourages students to try healthy fruits and vegetables at www.fns.usda.gov/tn/fruit-vegetable-challenge-packet.

Resources:

The University of Florida Extension
www.edis.ifas.ufl.edu/topic_vegetables_by_type

Wayne's World
www.waynesword.palomar.edu/ww0601.htm#oldest

Credits:

The Gymnosperm Database
www.conifers.org/topics/oldest.htm

1, 2, 3 Infinity?

Sample Pre-Post Assessment

1. What is an annual? Give an example:

2. What is a biennial? Give an example:

3. What is a perennial? Give an example:

4. Why and where do plants store food?

5. How does the plant's food storage affect the nutrients of that food?

Annual, Biennial or Perennial

Teacher Resource

Leaves		Stems		Roots	Fruits				Flowers
						Leaves			
Leaves	Bulbs	Stems	Tubers		Fruit	Seeds	Nuts	Seedpods	
Lettuce (A)	Onions (B)	Asparagus (P)	Potatoes (A & P)	Carrots (B)	Apples (P)	Lima beans (A)	Walnuts (P)	Sugar pea pods (A)	Cauliflower (A)
Cabbage (B)	Garlic (B)	Sugarcane (P)	Water chestnuts (P)	Beets (B)	Oranges (P)	Peas (A)	Peanuts ***(A)	Green beans (A)	Broccoli (A)
Celery (B)	Scallion (B)	Bamboo shoots (P)	Jicama (A & P)	Sugar beet (B)	Banana (P)	Sweet corn (A)	Pistachios (P)		Artichokes (P)
Spinach (A)			Jerusalem Artichokes (P)	Radish (B)	Mangos (P)	Spring wheat (A)	Pecans (P)		
Parsley (B)				Sweet potato (B) (Yam)**	Kiwi fruit (P)	Winter wheat (B)	Coconuts (P)		
Endive (B)					Grapes(P)	Oats (A)	Cashews (P)		
Tea (P)					Avocado (P)				

*Most people believe that celery is a plant stem or stalk. Not, so. The stalk of celery is actually a leaf petiole and not the plant stem. If a celery bunch is dismantled, the actual plant stem can be seen inside the center of the base. Rhubarb is also a leaf petiole.

** What we call a yam is actually a sweet potato. True yams come from Africa and are a much larger vegetable.

***Peanuts are not true nuts; they are legumes that grow as annuals.

1, 2, 3 Infinity? Quiz

Name _____

1. Complete the chart: (2 points for each answer)

	Raw Food Harvested	Part of the Plant We Harvest	Two Nutrients We Get
Annual			
Annual			
Annual			
Biennial			
Biennial			
Biennial			
Perennial			
Perennial			

2. Define annual, biennial and perennial on the back of the page. (10 points each)

3. Explain in one paragraph why it is important to eat a variety of fruits and vegetables. (6 points)

1, 2, 3, Infinity? Quiz

Name *Answer Key*

1. Complete the chart: (2 points for each answer)

	Raw Food Harvested	Part of the Plant We Harvest	Two Nutrients We Get
Annual	Lettuce	Leaves	Vitamins, Minerals
Annual	Watermelon	Fruit	Sugar, Minerals
Annual	Tomato	Fruit	Vitamins, Carbohydrates
Biennial	Winter Wheat	Fruit (Seed)	Oils, Protein
Biennial	Carrots	Root	Carbohydrates, Vitamins
Biennial	Sweet Potato (Yam)	Root	Carbohydrates, Vitamins
Perennial	Orange	Fruit	Vitamins, Sugar
Perennial	Asparagus	Stem	Vitamins, Minerals

2. An annual is a plant that lives its whole life cycle in one year. A biennial is a plant that lives its whole life cycle in two years. A perennial is a plant that lives for many years and completes its life cycle over many years

3. The essay should contain that fruits and vegetables all contain different nutrients. To obtain all of the nutrients needed a variety must be consumed. If you eat only a few fruits and vegetables or none at all you will be at risk of having a diet that is deficient in nutrients and may put your health at risk. For added credit, if students identify that consuming too much of some nutrients can also harm health or lead to weight gain give the students extra points

Garden Art

Subjects Taught: Art, English Language Arts

Grade Levels: 3rd-5th Grade

Brief Description: Students will be introduced to artists and their work in order to prepare them to create their own garden art or still life portraits. Appreciating the beauty of still life art and garden produce will increase interest in foods grown in the garden. Students will use that appreciation to develop promotional art to be displayed in the school to encourage fellow students to eat more fruits and vegetables.

Objectives: Students will:

1. Correctly identify several artists, their work, and their style of art.
2. Complete a decoupage artwork, traditional artwork, still life or virtual artwork using their sensory perception.
3. Students will create slogans to accompany their artwork that promote consuming fruits and vegetables and post those slogans with their artwork in the school cafeteria.

Life Skills: appreciating art, appreciating sensory experiences, assessing, cooperating, creative thinking, following directions, listening, promoting, understanding and manipulating art media

Materials Needed:

- Pictures of various art (see list of ideas in resources section of this lesson)
- Access to school garden or image(s) of other vegetable gardens
- Option One:
  - Dried plant parts or plant parts to be dried in class
  - Card stock paper
  - Mod Podge (available at any local craft store)
  - Paint brushes
  - Miscellaneous art supplies (construction paper, scrapbook stickers, etc.)
  - Plant Drying:
    - » Microwave and paper towels, OR
    - » Plant Press and newspapers.
- Option Two:
  - Various art supplies
- Option Three:
  - Computers with Internet access and color printers

Florida Standards Met At-A-Glance

Art Education	VA.3.C.1.1, VA.3.C.1.2, VA.3.C.2.2, VA.3.C.3.2, VA.3.F.1.1, VA.3.F.2.1, VA.3.F.3.2, VA.3.F.3.3, VA.3.H.1.1, VA.3.H.2.2, VA.3.O.2.1, VA.3.S.1.1, VA.3.S.1.2, VA.3.S.1.3, VA.3.S.2.2, VA.3.S.3.1, VA.3.S.3.3, VA.4.C.1.1, VA.4.C.1.2, VA.4.C.2.2, VA.4.C.2.3, VA.4.F.1.1, VA.4.F.2.2, VA.4.H.1.3, VA.4.H.2.1, VA.4.S.1.1, VA.4.S.3.1, VA.4.S.3.2, A.4.S.3.3, VA.5.C.1.1, VA.5.C.1.2, VA.5.C.1.3, VA.5.C.2.2, VA.5.F.1.1, VA.5.F.2., VA.5.F.3.2, VA.5.F.3.4, VA.5.H.1.2, VA.5.H.2.1, VA.5.O.2.1, VA.5.S.1.1, VA.5.S.1.3, VA.5.S.2.2, VA.5.S.2.3, VA.5.S.3.1, VA.5.S.3.3
English/Language Arts	3.W.1.2, 3.W.1.3, 4.W.1.2, 4.W.1.3, 4.W.2.4, 5.W.1.2, 5.W.1.3, 3.L.3.6, 4.L.3.6, 5.L.3.6
Health	HE.4.B.3.3, HE.4.C.1.1, HE.5.C.1.1

Time:

Inspiration Time: 10 minutes to observe garden area (or garden images)
Classwork Time: 2-3 class periods (50 minute periods)
(Select the art option that best suits your classroom situation and resources available to you. Time recommended for preparation is as follows.)

Option One: Decoupage
Preparation Time:
Teacher and/or students will need 45-60 minutes for gathering materials
Drying Options:
Microwave – approximately 15 minutes for drying, one day for pressing
Traditional – approximately 7-10 days

Option Two: Traditional artwork (paint, chalk, pencils, etc.)
20 minutes to study art and decide on media

Option Three: Electronic artwork
20-30 minutes to prepare students to use a specific program (Paint, Word, the Internet, National Gallery of Arts Still Life PowerPoint, etc.)

Preparation:

Teacher Preparation:

1. Teacher will need to look up images of famous artwork to serve as a reference guide for students. A list of examples can be found in the resource section of this lesson.

2. Gather materials that will be used for the decoupage project. This will include, but not be limited to: dried fauna materials; non-dried fauna materials that will be dried in class; additional craft materials such as construction paper, stickers, etc.; mod podge (or other glue-like agent).
3. If you choose to use plant parts from your existing school garden, you will need to gather some additional materials to make a plant press. There are many methods of drying plants. However, the two methods recommended include microwaving or drying with a plant press. See activity section at the end of this lesson for directions on both processes.

Student Preparation:
You may invite students to bring in leaves, flowers or other plant materials from a home garden to use in their decoupage project.

Vocabulary:

Decoupage, fauna, flora

Background Information:

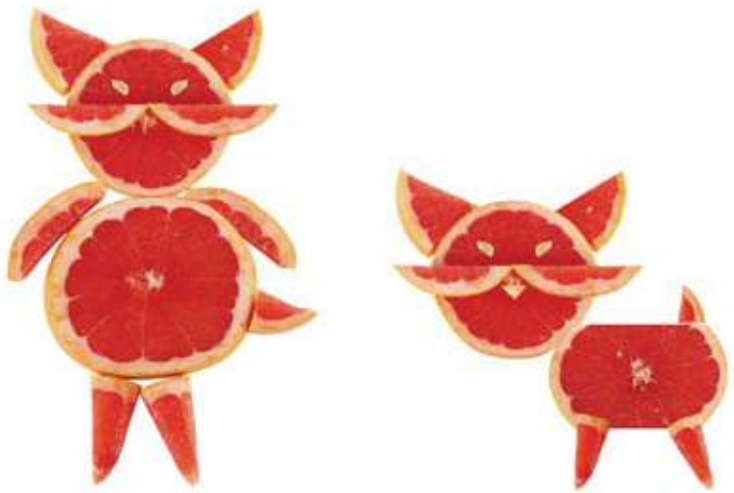
The appreciation of the sensory experience of eating nutritional and healthy foods is often lost in our fast-paced, fast food world. In the past, and in other cultures, dining was and is a family event. Food takes time to prepare and enjoy. If we are to encourage the consumption of healthy fruits and vegetables, particularly vegetables, an appreciation of the sensory experience is important. That is where art comes into play. Becoming familiar with fine art from the masters (which elevates fruits, vegetables and prepared foods to art), increases appreciation. Having students convert images from their own garden to art does the same. It helps students slow down, see the beauty in the garden and foods they are growing, and engage their senses in ways that help them develop an appreciation. Using that appreciation to promote the consumption of more fruits and vegetables will result in more nutrient dense food choices, increasing the consumption of fruits and vegetables.

Teachers should refer to the list of artists in the resource section of this lesson to familiarize themselves with the art.

Activity One:

1. Present pictures of still life artwork to the students.
2. Identify for the students the artists, name of the piece, era and style.
3. Using a graphic organizer of your choice, compare and contrast the art. Have students make their own observations about the art to develop their own list of similarities and differences. Have students include a category

for how the art makes them feel. Describe key elements of different styles of art, focusing on types of art media. For example, oils, watercolors, photographs, digital, decoupage, etc.



Activity Two:

Option One – Decoupage:

1. Students visit the school garden. They should use sensory perception to gather ideas to be turned into a decoupage project. They should take notes on the colors, smells, shapes, spatial awareness, and other observations.
2. Based on students' observations of the garden(s), explain to them that they will create a decoupage art piece using their ideas and perceptions gathered from the garden.
3. Explain decoupage to students. Decoupage is the art of layering materials with the use of a glue-based substance.
4. Collect materials to be dried and pressed. You may choose to buy dried plant materials, or you can dry plant materials from your school garden or students' home garden.
   Examples of plant material that can be dried and used in decoupage include, but are not limited to vegetable/fruit seeds; flower petals, stamen, anther and filament; stems or twigs; leaves of all shapes, colors and sizes; fruit peels; cross section cuts of vegetables; and roots.
5. If you choose to buy dried plant parts, skip to number 7. If you plan to dry your own materials, select one of the following methods for drying:
   a. Microwave:
      i. Separate plant parts and lay them spread out, between two paper towels. It is recommended that you pull off all leaves, flower petals, seeds, stems and other materials to microwave separately. The more pieces you are able to separate, the more students will have to choose from for their piece.
      ii. Place the similar material types together in between paper towels, and on a microwave-safe plate. You should microwave all stems together, flower petals together, seeds together, etc.
      iii. Depending on the plant material, you will need to microwave on low for 15-45 seconds. Keep in mind, stems and other, denser materials will need longer microwave time, whereas lighter, more colorful material will need less time.
      iv. Once the plant material is dried, place it under a heavy book for flattening. Let it rest for at least one day.
   b. Traditional:
      i. Separate plant parts and lay them spread out. It is recommended that you pull off all leaves, flower petals, seeds, stems and other materials to store separately. The more pieces you are able to separate, the more students will have to choose from for their piece.
      ii. Place similar plant materials together between newspapers. The newspapers will absorb any liquid from the plant parts.
      iii. Build a plant press:
         1. Use two 12-inch square pieces of heavy cardboard. Layers of newspaper and plant material will be placed between the cardboard pieces.
         2. Tie tightly together using rope or string.
         3. Tighten the ropes each day for seven to 10 days.
      iv. Place layers of similar plant materials between the cardboard pieces. You should keep all stems together, flower petals together, seeds together, etc.
      v. This drying process will require anywhere from seven to 10 days to complete.
      vi. Don't be tempted to take a peek at the layered plant materials. If the plant materials aren't completely dried, you may risk damaging the material because they may rip as you separate the layers.
      vii. Once plants are dried, take them out from between the newspaper layers.
6. Organize the dried plant materials by color so that students can select materials based on the colors.
7. Provide each student with a piece of card stock. Depending on your classroom procedures, and in addition to the dried plant materials, students will need access to paint brushes, mod podge and other craft materials.
8. Explain how to effectively use mod podge, starting with a thin layer of mod podge glue, and then layering pieces of plant material, colored paper, and other craft materials. Be sure to apply a light layer of mod podge after each new item is placed on their work.

9. Once students have created their garden decoupage masterpiece, they will need to apply a medium layer of mod podge as a topcoat.
10. Let the work dry for 24-48 hours.
11. After the decoupage work is completely dried, invite students to share their art with the class, describing their inspiration and methods for selecting certain colors, textures, and other elements.

Option Two – Artwork or Photography

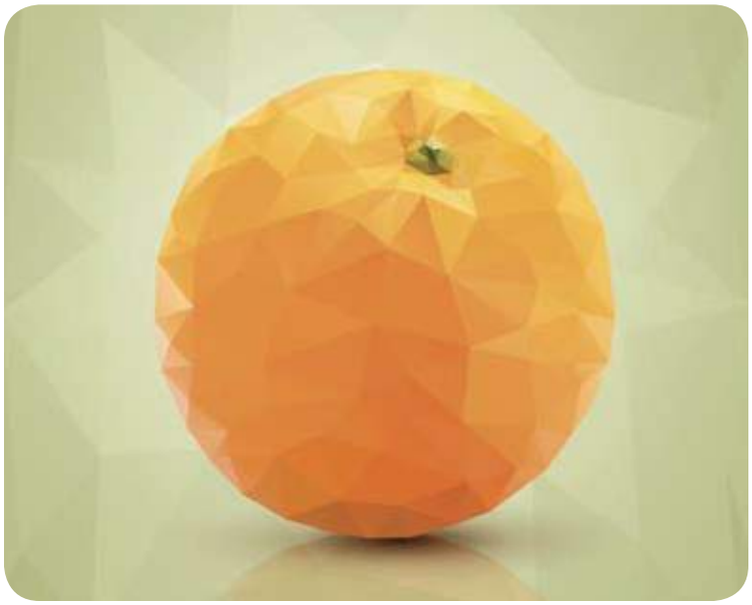
1. Have students select the medium that they would like to utilize and replicate from the student organizer list of fine art.
2. Using the garden or materials from the garden to create a still life, have students create their own 'fine art' replicating the technique they liked best from the fine art example.
3. Prepare and display art for public viewing along with produce from the garden.

Option Three – Electronic Art

1. Ask students to select items from the garden that they would like to use as images in a still life.
2. View the "National Gallery of Arts Still Life" PowerPoint program at www.nga.gov/kids/zone/stilllife.htm
3. Have students create a virtual still life using the National Gallery of Arts' Still Life tool available at www.nga.gov/kids/zone/stilllife.htm
4. Once complete have the students print their composition.

Activity Three:

1. Survey students in the school cafeteria about their fruit and vegetable consumption during lunch.



2. Use the artwork to promote eating more fruits and vegetables by having students develop catchy, creative advertising slogans to accompany their artwork.
3. Post the artwork and slogans in the school cafeteria.
4. Re-survey students to determine if artwork and slogans increased the consumption of fruits and vegetables during the school lunch period.

Evaluation Options:

1. Have students compare fine art to the art used in advertising with a focus on emotions and actions encouraged by advertising versus fine art.
2. Assess student efforts in creating and compiling information in a rubric.
3. Assess student work in creating and understanding art.
4. Ask students to compare, in writing, their feelings about the garden produce before and after developing artwork about it.

Extensions or Variations:

1. Invite an artist into the classroom who has still life productions of nature, gardens or similar settings.
2. Host an art show in combination with a meal prepared with foods from the garden that highlights students' work.
3. Bring in a local chef to prepare some tasty fare with the foods used in the art so its life imitating art or art imitating life.

Resources:

Below are recommendations for artwork that may serve as examples for students. The pieces are simply suggestions. There are countless others.

Masters

- Paul Cezanne's numerous still life works such as-"Apples and Oranges", "Cherries and Peaches", "Onions", "Still Life with Apples," "Still Life with Plate of Cherries," "Still Life with Quince, Apples and Pears," "Still Life with Peppermint Bottles," "Still Life with Apples, a Bottle, and a Milk Pot," or "Still Life with Melons and Apples"
- Juan Sánchez Cotán's "Quince, Cabbage, Melon and Cucumber"
- Vincent van Gogh's "Two Cut Sunflowers" that focus on the ripening sunflower seeds
- George Flegle's "Still Life with Pygmy Parrot" (includes fruits and nuts)
- Martin Johnson Heade's "Two Oranges with Orange Blossoms"
- Claude Monet's paintings of "Pears and Grapes"

- Giuseppe Arcimboldo's "Vertumnus"
- Henri de Toulouse Lautrec's "Celeyran View of the Vineyards"

Contemporary Artists

- Alfredo Gomez's "Still Life with Oranges and Pears."
- Debra Sisson's "Red and Yellow Bells" (bell peppers) or "Produce Tomato"
- Bespruzhnaya Ludmila's "Still Life with Vegetables"
- Dean Wuittle's "Fruit and Vegetables Still Life"
- Daniel C. Chiriac's "Tomatoes, Spaghetti, Onion, Garlic, and a Stainless Steel Pot", "One and a Half Peach," " Sliced Lemon," "Two Tangerines," "Three Hot Peppers in the Shape of Pi," or "Red Pepper"

It's on the Label

Subjects Taught: Language Arts, Mathematics, Health, Physical Education

Grade Levels: 3rd - 5th Grade

Brief Description: Learning to read and utilize food labels and information from the U.S. Department of Agriculture, students will compare nutritional value and caloric content of canned, frozen, and fresh fruits and vegetables, compare portions to serving sizes by actually measuring both and scale label information in direct proportion to recommended caloric intake.

Objectives: Students will:

1. Read nutritional value and caloric content from food labels.
2. Compare and contrast portions to serving sizes by actual measuring.
3. Convert standardized food label information in direct proportion to recommended caloric intake for individuals.
4. Analyze and compare nutritional values and caloric content of five types of canned, frozen and/or fresh fruits or vegetables.
5. Use all the capabilities developed to create an economical, year-round plan to increase fruit and vegetable consumption in the diet.

Life Skills: analyzing, communicating, comparing, evaluating, obtaining information, measuring, reading for content

Materials Needed:

- Either copies of *Shop Smart – Get the Facts on Food Labels* found under the National Nutrition Month label on pages 117-118 (one per student) or ensure that students have computer access and that the site is available.
- Posters of fresh fruit and vegetable nutritional value and caloric content (listed in resources from FDA)
- Copies of the student handouts- one per student:
  Shop Smart – Get the Facts on Food Labels
  Canned, Frozen or Fresh?
- Internet access
- Multiple packages or nutrition labels from canned and frozen vegetables (green beans, peas, corn, spinach, carrots, yellow beans) and fruits
- Dry ingredients to measure (i.e., rice)
- Water or milk to measure
- Measuring cups

Time:

Activity One: 1 hour, plus time for research
Activity Two: 45 minutes, plus time for research
Activity Three: 30 minutes

Preparation:

- Either download and print copies of student handout *Shop Smart – Get the Facts on Food Labels* on pages 117-118 (one per student) or ensure that students have computer access.
- Download and print copies of the fresh fruit and vegetable posters available through the FDA website (links are in the resources section).
- Print out labels provided in the lesson or collect and bring in food labels to class.
- Gather measuring cups.
- Work with the school cafeteria to obtain various components of the school lunch program, plates and glasses and/or ingredients such as dry rice to use in the measuring demonstrations.
- Optional: Review the following web links and possibly share with students as an opening activity.
  www.healthymeals.nal.usda.gov/hsmrs/EY/interact/interact/index02.htm reading labels

Florida Standards Met At-A-Glance

English/Language Arts	3.W.1.2, 3.W.3.7, 3.W.3.8, 4.W.1.2, 4.W.3.7, 4.W.3.8, 5.W.1.2, 3.W.3.7, 5.W.3.8
Mathematics	4.MD1.1
Physical Education	PE.3.L.2.12, PE.4.L.2.13, PE.5.L.2.12
Health	HE.3.B.1.4, HE.3.B.4.2, HE.4.C.1.1, HE.5.B.1.4, HE.5.B.4.2, HE.5.C.1.1

Vocabulary: caloric content, nutritional value, portion, serving size

Background Information:

Reading the nutritional label found on many foods may seem straight forward, but for most students it will be a new experience. These are the components of the food label and instructions for a methodology for reading one from the U.S. Food and Drug Administration (one of the agencies that created the requirements for food labels).

Food label information has been standardized for adults who should be consuming a 2,000 calorie diet. So for younger, smaller students the amounts should be adjusted appropriately.

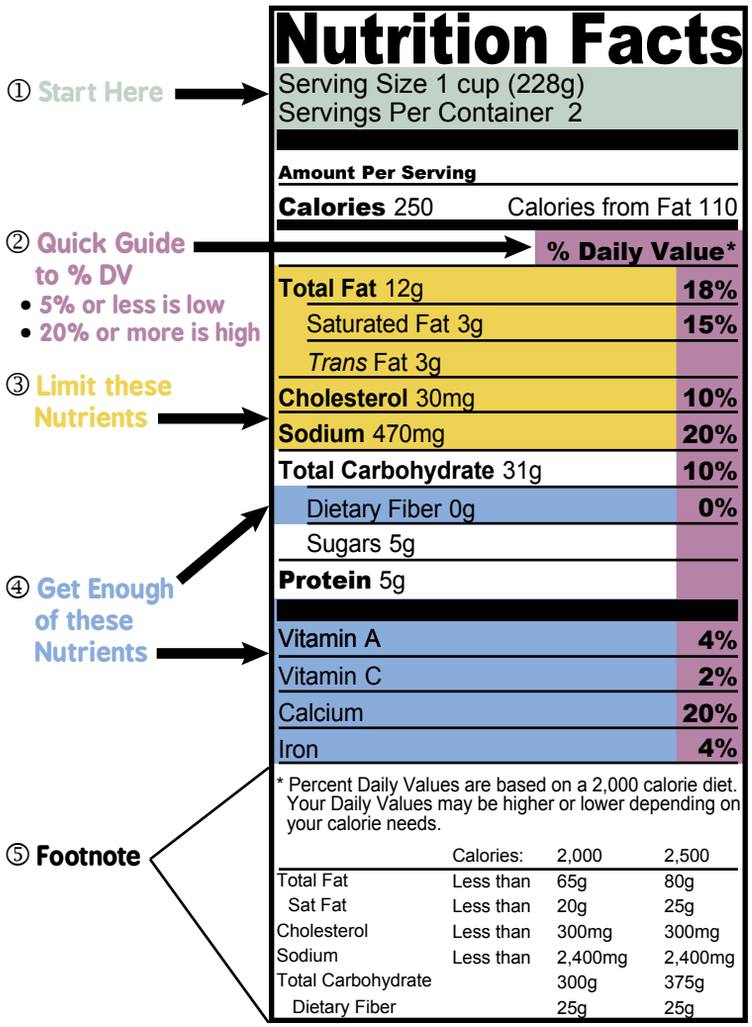
Not all foods are labeled. What foods are not? Raw fruits, vegetables, and fish are not labeled. Foods manufactured by small businesses are not required to have labels because the expense of research and label development would put them out of business. Foods consumed away-from-home at restaurants, bakeries and delicatessens or consumed immediately at locations such as food trucks, fairs and street vendors are not labeled because of the small business exemption. Single-serve, packaged ingredients such as condiments are not labeled. Also, other food items don't have labels because they have 'no nutritional significance' such as coffee, tea, bottled water or spices. How can nutritional information of these foods be obtained? It is available by using the U.S. Department of Agriculture's Nutrient Database that is covered in both the "Nutrient Tally" and "Nutrient Database" lessons in this book.

The issue of restaurant labeling is being revisited and this is changing, particularly for chain restaurants. Many of these restaurants are voluntarily developing and making nutritional information available. Overall, the concept is to give consumers as much information as possible without placing onerous burdens on small businesses or where exact servings may be altered in the food preparation.

Sample Label for Macaroni & Cheese

This lesson has four purposes:

- First is to educate students to read food labels. Research shows that adults reading food labels have healthier diets and maintain healthier weights.
- Second is to make clear to students the difference between serving sizes and portion sizes.
- Third is to help students convert label information standardized for a 2,000 calorie daily diet recommendation into information appropriate for the number of calories the student should consume each day.
- Fourth is to dispel myths about the nutritional differences between fresh, frozen and canned fruits and vegetables. Increasing consumption of fruits and vegetables is important to the overall health of the U.S. population, regardless of whether they are fresh, frozen or canned. The prohibitively high cost of fresh fruit and vegetables can be overcome by buying these items frozen or canned. Use of a home garden is also a cost-savings device and an ideal source of vegetables and fruits. Having a school garden and teaching students how to garden is a great way to provide students with the skills needed to become life-long gardeners. In addition, it will increase their willingness to consume fruits and vegetables and provide them with a way to contain food costs and eat more fruit and vegetables.



As of August 2014 when Gardening for Nutrition was going to the printer, changes to the format of food labels were being considered and had not been adopted by the U.S. Food & Drug Administration.

Activity One:

1. Show students the FDA video *The Food Label and You* (Set as a CSI Investigation) at www.fda.gov/food/ingredientspackaginglabeling/labelingnutrition/ucm275409htm to introduce the topic to your students.
2. Have students read the article, *Shop Smart — Get the Facts on Food Labels* and answer the comprehension questions on the student worksheet.
3. Using real nutrition labels from fruits and vegetables or if those are not available use the labels from frozen and canned peas that are included with this lesson, have students focus attention on calories per servings, vitamins, and minerals.

a. Compare a canned fruit label and a canned vegetable label. Ask:
"Which had more calories per serving – the fruit or the vegetable?"
"Which has more Vitamin C – the fruit or the vegetable?"
"Which has more Vitamin A – the fruit or the vegetable?"
"Which has more minerals – the fruit or the vegetable? And what type of minerals?"

b. Compare canned and frozen vegetables of the same type (green beans, peas, corn, spinach, carrots, yellow beans, etc.) and have students complete the *Canned, Frozen or Fresh?* student handout.

4. Discuss their observations of the comparisons. Ask:
"Are all columns similar?" *(No)*
"Is one significantly better or worse in any category than another?" *(It varies with food selected.)*
"Is there one column (fresh, canned, frozen) that is always lowest in certain nutritional value or caloric content?" *(No)*
"Is this information surprising?"
"If the prices are comparable which is the best nutritional value?"
5. Have students discuss value, benefit and limitations of vegetable or fruit food labels. Ask:
"How do nutrition labels provide a quick comparison between foods?" *(They compare the same categories, provide information about a few key nutrients, compare fat, sugar and calories, etc.)*
"Do the nutrition labels provide all the information there is to know about a food? *(No)*
"Are there other nutrients in foods that are important to your health? *(Yes)*
"Where can you find additional information?" *(USDA's Nutrient Database)*

Activity Two:

1. Explain that research has shown that people tend to underestimate the amount of food they eat and overestimate the amount and intensity of exercise they conduct. Portion sizes are generally three to four times the normal serving size for many foods with the exception of vegetables and fruits. The exception is juice, which has large serving sizes. Using the various measuring cups and ingredients, have students demonstrate the size they would consider and the average portion size. Rice is a good material to use for this purpose and they can pretend that it is a food prepared to eat. (Students can also research their favorite restaurant foods on the websites of chain restaurants.)
2. Reading nutrition labels or researching the information online at www.*MyPlate*.gov, determine the actual serving sizes for those same foods.
3. Discuss the difference between the portion size and the actual serving size. How many servings are they actually eating of any given food?

Frozen vs. Fresh vs. Canned

1. Produce for freezing is picked off the vine at its peak of ripeness and nutritional content, and is quickly frozen to a temperature that maximally locks in its vitamins, minerals, antioxidants and flavor. The sooner produce is frozen after picking, the more vitamins and minerals it will retain. While some early nutrient loss does occur with the first steps in the freezing process, the low temperature keeps produce at optimal quality for approximately one year. Depending on the cooking method you choose or how you prepare the vegetable, it also may taste very similar to the fresh variety.

2. Canning has been around for 200 years, and involves cooking food in a can or jar as it's sealed. As long as the container stays sealed, the contents will remain stable, retain its food quality and nutrient content and have a long shelf life. Dented or bulging cans need to be thrown out. Canning (high temperatures and sterile containers) destroys organisms that would cause spoilage so no need for preservatives. Salt and sugar, often added to canned vegetables, is therefore used for flavoring, not preservation, and can take a very healthy vegetable and make it less desirable than its fresh or frozen counterpart.

3. By the time produce is eaten, fresh, frozen or canned, it may have few differences in nutritional value. Choosing a mix of produce in order to help families more easily, inexpensively and creatively meet recommended daily servings without sacrificing nutrition is the idea.

"Florida Seasonal Fruits & Vegetables, What's in Season in Florida?" By Molly Watson, About.com Guide *www.localfoods.about.com/od/searchbyregion/a/floridaseasons.htm.*

4. Have students review serving sizes and the number of servings of fruits and vegetables recommended for their age group on a daily basis.
5. Ask how many students meet this requirement.
6. Journal the information and have students forecast the impact of the portions they are eating of each *MyPlate* category – both positive and negative.

Activity Three:

1. Share the information in this chart and explain to students that people have varying energy needs depending on their age and activity level. This chart is for students ages 7 to 12. (This topic will be covered in more depth in the lesson "Energy In/Energy Out.")

Estimated Calorie Needs

Age	Male			Female		
	Sedentary	Moderately Active	Active	Sedentary	Moderately Active	Active
7	1400	1600	1800	1200	1600	1800
8	1400	1600	2000	1400	1600	1800
9	1600	1800	2000	1400	1600	1800
10	1600	1800	2200	1400	1800	2000
11	1800	2000	2200	1600	1800	2000
12	1800	2200	2400	1600	2000	2200

Institute of Medicine Dietary Intakes Micronutrients Report. 2002. (Actually Kilocalories)

2. Explain that two federal agencies - (Food & Drug Administration [FDA] and U.S. Department of Agriculture [USDA]) - developed a nutritional label that had to be the standard used for all people. So, the nutrition information on the label is standardized for an average adult that should be consuming 2,000 calories per day. Ask:
"Are you an average adult?" *(No)*
"Looking at this chart, should you be consuming 2,000 calories per day?" *(Answers will vary but for most students the answer will be no.)*
"Is the information on the nutrition label accurate for the percentage of nutrients you will be receiving from a specific food?" *(Answers will vary but for most students the answer will be no.)*

Note: Some labels also contain information for a 2,500 calorie diet to account for adult males.

3. Explain that they now will convert the information on the nutrition label so that it is correct for their age and gender. How will they do this? (This math activity may be more appropriate for older elementary.) Create a mathematical formula:
For example, take a child that should be consuming 1,000 calories per day and the frozen pea label included with this lesson. The label states that a person consuming 2,000 calories per day would get 30 percent of their vitamin C by eating one half cup of frozen peas but this child is only supposed to eat 1,000 calories so if they ate the half cup serving they would be getting twice as much vitamin C.

$$\frac{\text{2,000 adult calories}}{\text{1,000 child calories}} = \frac{\text{X \% of vitamin C provided to child}}{\text{30\% of vitamin C provided to adult}}$$

The child is eating ½ or 50% of the calories of the adult. So divide the adult percentage of Vitamin C by 50% (or ½) and the child percentage of vitamin C is 60% for a half cup serving.

4. Have students calculate the percentage of calories they should be consuming and divide that into the percent of vitamin C provided by a single serving. This percentage can then be used on all label amounts.

Evaluation Options:

1. Assess students' completion of the reading and worksheet assignment.

Smart – Get the Facts on Food Labels

1. Find out what foods are a good source of fiber, calcium, iron, and vitamin C. Compare similar foods to see which one is lower in calories and fat. Search for low-sodium foods. Search for foods low in saturated fats and trans fats.
2. Serving size and portions
3. Total calories and fat, dietary fiber, saturated fats and trans fats, percent of daily values, vitamins and minerals.

"Canned, Frozen or Fresh?" Student Handout – Answers will vary with the choice of vegetables evaluated.

2. Ask the students to select and review the nutritional value and caloric content of five fruits and/or vegetables from the school garden and fresh produce information from the USDA Nutrient Database and write this information in their science notebook. Have them create a chart with

a row for each per the student handout. Assess students' science notebook for fruit/vegetable nutritional value comparison using a checklist for completion and for fruit/vegetable caloric content comparisons. A *It's On the Label Checklist* is included with this lesson for evaluating the journaling.

Example:

Name:	Canned	Frozen food	Fresh produce
Vitamin A			
Vitamin C			
Iron			
Calcium			
Sodium			
Caloric content			

3. Provide students with two labels – one a nutritious food and the other a candy, cookie or snack food. Have them identify which one meets the guidelines of *MyPlate* and which one does not.
4. Have students research and write a report as a plan about which fruits and vegetables they can eat inexpensively in season or grow in a garden inexpensively in season, and which fruits and vegetables they can eat inexpensively out-of-season in either a canned or frozen form.
5. Have students use the percentage of the 2,000 calorie diet that they should consume (as developed in activity three) and recalculate the nutritional information on a food label as it should apply to him or her.

Extensions and Variations:

1. Have the school cafeteria manager speak to the class about the Farm to School program or other programs promoting eating local fruits and vegetables in season and how they are incorporated into the school lunch program, changes to the school lunch program, how they calculate servings and meet USDA standards.
2. Conduct a scientific experiment showing how to blanch vegetables from the garden prior to freezing and why this is done.
3. Have students as individuals or in small groups answer these questions: "Would we find the same results using organic fruits or vegetables? If expense is an issue, what is your best option?"
4. Have students compare the format of the current food label to a new food label the U.S. Food & Drug Administration (FDA) was considering at the time this book went to print in 2014 at www.fda.gov/food/guidanceregulation/guidancedocumentsregulatoryinformation/labelingnutrition/ucm385663.htm#images How are the two labels different? Why is the FDA considering making a change? How will the new food label affect consumers?

Resources:

Food finders website compares canned to frozen
www.guidingstars.com/tag/food-labels

Fresh Fruit Poster:
www.fda.gov/downloads/Food/LabelingNutrition/FoodLabelingGuidanceRegulatoryInformation/InformationforRestaurantsRetailEstablishments/UCM153464.pdf

Fresh Vegetable Poster:
www.fda.gov/downloads/Food/LabelingNutrition/FoodLabelingGuidanceRegulatoryInformation/InformationforRestaurantsRetailEstablishments/ucm063477.pdf

Figuring Out Food Labels:
www.kidshealth.org/kid/stay_healthy/food/labels.html

Shop Smart — Get the Facts on Food Labels

Become a smart shopper by reading food labels to find out more about the foods you eat. The Nutrition Facts panel found most food labels will help you:

- Find out which foods are good sources of fiber, calcium, iron, and vitamin C
- Compare similar foods to find out which one is lower in fat and calories
- Search for low-sodium foods
- Look for foods that are low in saturated fat and trans fats

A Quick Guide to Reading the Nutrition Facts Label

Start with the Serving Size

- Look here for both the serving size (the amount for one serving), and the number of servings in the package.
- Remember to check your portion size to the serving size listed on the label. If the label serving size is one cup, and you eat two cups, you are getting twice the calories, fat and other nutrients listed on the label.

Check Out the Total Calories and Fat

Find out how many calories are in a single serving and the number of calories from fat. It's smart to cut back on calories and fat if you are watching your weight!

Let the Percent Daily Values Be Your Guide

Use percent Daily Values (DV) to help you evaluate how a particular food fits into your daily meal plan:

- Daily Values are average levels of nutrients for a person eating 2,000 calories a day. A food item with a 5% DV means 5% of the amount of fat that a person consuming 2,000 calories a day would eat.
- Remember: percent DV are for the entire day — not just for one meal or snack.
- You may need more or less than 2,000 calories per day. For some nutrients you may need more or less than 100% DV.

For more food label information, visit the Food and Drug **Administration at www.fda.gov/Food/ResourcesForYou/Consumers**

Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container 2

Amount Per Serving	
Calories 250	Calories from Fat 110
	% Daily Value*
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 1.5g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Protein 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%

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

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

As of August 2014 when Gardening for Nutrition was produced, changes to the format of food labels were being considered and had not been adopted by the U.S. Food & Drug Administration.

The High and Low of Daily Values

- 5 percent or less is low — try to aim low in total fat, saturated fat, cholesterol, and sodium
- 20 percent or more is high — try to aim high in vitamins, minerals and fiber

Limit Fat, Cholesterol and Sodium

Eating less of these nutrients may help reduce your risk for heart disease, high blood pressure and cancer:

- Total fat includes saturated, polyunsaturated and monounsaturated fat. Limit to 100% DV or less per day.

Shop Smart — Get the Facts on Food Labels

continued

- Saturated fat and trans fat are linked to an increased risk of heart disease.
- Sodium — high levels can add up to high blood pressure.
- Remember to aim low for % DV of these nutrients.

Get Enough Vitamins, Minerals and Fiber

- Eat more fiber, vitamins A and C, calcium, and iron to maintain good health and help reduce your risk of certain health problems such as osteoporosis and anemia.
- Choose more fruits and vegetables to get more of these nutrients.
- Remember to aim high for % DV of these nutrients.

Additional Nutrients

- Carbohydrates — There are three types of carbohydrates: sugars, starches and fiber. Select whole-grain breads, cereals, rice and pasta plus fruits and vegetables.
- Sugars — simple carbohydrates or sugars occur naturally in foods such as fruit juice (fructose), or come from refined sources such as table sugar (sucrose) or corn syrup.

Check the Ingredient List

Foods with more than one ingredient must have an ingredient list on the label. Ingredients are listed in descending order by weight. Those in the largest amounts are listed first. Effective January 2006, manufacturers are required to clearly state if food products contain any ingredients that contain protein derived from the eight major allergenic foods. These foods are milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat and soybeans.

What Health Claims on Food Labels Really Mean

FDA has strict guidelines on how certain food label terms can be used. Some of the most common claims seen on food packages:

- Low calorie — Less than 40 calories per serving.
- Low cholesterol — Less than 20 mg of cholesterol and 2 gm or less of saturated fat per serving.
- Reduced — 25% less of the specified nutrient or calories than the usual product.
- Good source of — Provides at least 10% of the DV of a particular vitamin or nutrient per serving.
- Calorie free — Less than 5 calories per serving.
- Fat free / sugar free — Less than 1/2 gram of fat or sugar per serving.
- Low sodium — Less than 140 mg of sodium per serving.
- High in — Provides 20% or more of the DV of a specified nutrient per serving.
- High fiber — 5 or more grams of fiber per serving.

FDA also sets standards for health-related claims on food labels to help consumers identify foods that are rich in nutrients and may help to reduce their risk for certain diseases. For example, health claims may highlight the link between calcium and osteoporosis, fiber and calcium, heart disease and fat or high blood pressure and sodium.

For a referral to a registered dietitian nutritionist and for additional food and nutrition information, visit ***www.eatright.org***.

This tip sheet is provided by:
Authored by registered dietitian nutritionists on staff with the Academy of Nutrition and DieteticsSources:
US Food and Drug Administration, ADA Complete Food & Nutrition Guide

Get the Facts on Food Labels

Student Worksheet

Name: _____ **Date:**_____

Read the "Shop Smart – Get the Facts on Food Labels" your teacher provides for you.

1. What are four ways you can use a food label?

2. When you read a label, what are two important items to look for?

3. After reading this article, what are some healthy things to look for on a label?

Frozen and Canned Peas Labels

As of August 2014 when Gardening for Nutrition was going to the printer, changes to the format of food labels were being considered and had not been adopted by the U.S. Food & Drug Administration.

Frozen Peas

Serving Size 1 cup (1g)
Serving Per Container 3

Amount Per Serving	
Calories 60	
	% Daily Values*
Total Fat 0g	**0%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 0mg	**0%**
Total Carbohydrate 11g	**4%**
Dietary Fiber 6g	**24%**
Sugars 5g	
Protein 5g	**10%**
Vitamin A 15% •	Vitamin C 30%
Iron 6%	

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

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2400mg	2400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Canned Peas

Serving Size 1 cup (1g)
Serving Per Container 3

Amount Per Serving	
Calories 60	
	% Daily Values*
Total Fat 0g	**0%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 380mg	**16%**
Total Carbohydrate 12g	**4%**
Dietary Fiber 3g	**12%**
Sugars 4g	
Protein 4g	**8%**
Vitamin A 6% •	Vitamin C 10%
Calcium 2% •	Iron 8%

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

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2400mg	2400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Canned, Frozen or Fresh?

Name _____

Read the labels of canned and frozen vegetables and research fresh vegetables at the USDA Nutrient Database at *www.ndb.nal.usda.gov/* to complete this chart.

Name of Vegetable:			
	Canned	**Frozen food**	**Fresh produce**
Vitamin A			
Vitamin C			
Sodium			
Calcium			
Caloric content			

Name of Vegetable:			
	Canned	**Frozen food**	**Fresh produce**
Vitamin A			
Vitamin C			
Sodium			
Calcium			
Caloric content			

It's on the Label Checklist

Name: _____ **Date:** _____

Science notebook checklist for fruit/vegetable Vitamin A comparison

5 items listed and compared	5 points
4 items listed and compared	4 points
3 items listed and compared	3 points
2 items listed and compared	2 points
1 item listed and compared	1 points
Assignment not completed	0 points

_____

Science notebook checklist for fruit/vegetable Mineral comparison

5 items listed and compared	5 points
4 items listed and compared	4 points
3 items listed and compared	3 points
2 items listed and compared	2 points
1 item listed and compared	1 points
Assignment not completed	0 points

_____

Science notebook checklist for fruit/vegetable Vitamin C comparison

5 items listed and compared	5 points
4 items listed and compared	4 points
3 items listed and compared	3 points
2 items listed and compared	2 points
1 item listed and compared	1 points
Assignment not completed	0 points

_____

Science notebook checklist for fruit/vegetable caloric content comparison

5 items listed and compared	5 points
4 items listed and compared	4 points
3 items listed and compared	3 points
2 items listed and compared	2 points
1 item listed and compared	1 points
Assignment not completed	0 points

_____

Nutritional value and caloric content checklist: each section is complete and correct based on package data. Analyze basic nutritional value and caloric content from a can, a frozen food bag and the fresh fruit and/or vegetable posters and write the data in a science notebook in a chart.

Name:	Canned	Frozen food	Fresh produce
Vitamin A			
Vitamin C			
Iron			
Calcium			
Sodium			
Caloric content			

My Meal Choices

Subjects Taught: Health, Physical Education, Science, Language Arts, Mathematics

Grade Levels: 3rd-5th Grade

Brief Description: Student will collect personal meal consumption data, align those foods to the food guide food groups, and cross reference that information with the *MyPlate* to compare personal eating habits and to recommended guidelines. Students also will use that information to create their own food web.

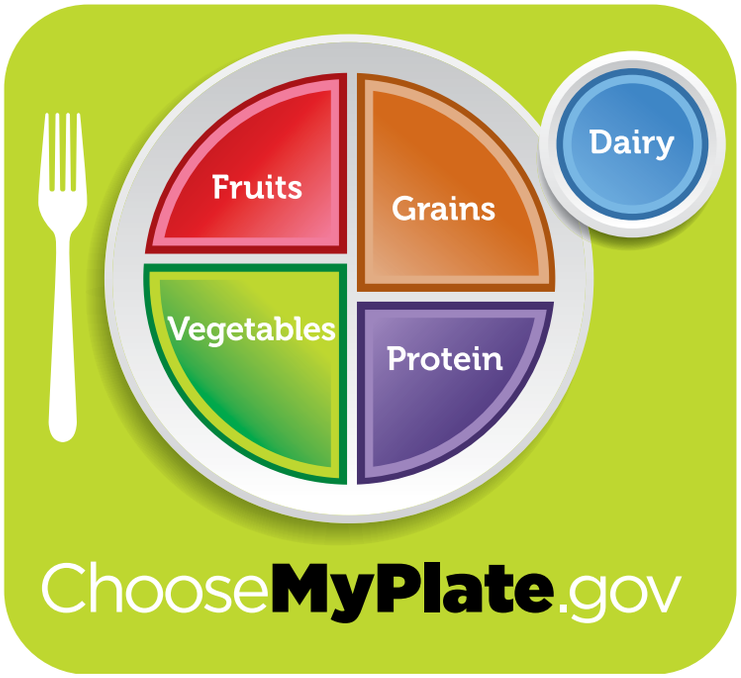
Objectives: Students will:

1. Document each meal and snack over a one week period on *Diary of My Meal Choices* student handout.
2. Designate food information collected into *MyPlate*.
3. Compare own meal data with the recommended data to analyze their healthy eating status.
4. Reflect on personal eating habits and determine changes to be made in diet.
5. Create their own personal food web that demonstrates how the food they eat is a result of the interactions between the geosphere, atmosphere, hydrosphere and biosphere.

Life Skills: analyzing, communicating, following directions, obtaining information, using technology

Materials Needed:

- *"Diary of My Meal Choices"* student handout — one or more per student as needed
- *MyPlate* worksheet on page 128.
- Science notebook for collaboration and reflection



- *Food Group and My Plate* checklist — one per student
- Computers with Internet access for each student

Time:
Four to five 30-minute sessions plus time for daily meal documentation on hard copy or online

Preparation:

1. Review websites listed under resources.
2. Provide a listing of food groups and portions as per USDA recommendations.
3. Copy *MyPlate* worksheet on page 128 and copy *Diary of My Meal Choices* student handout on page 130 or plan on having students journal online on a daily basis.

Florida Standards Met At-A-Glance

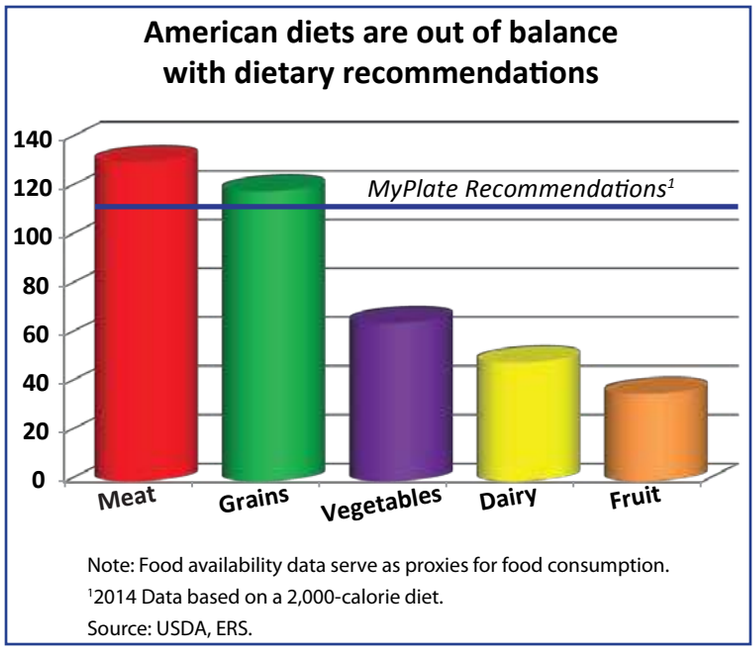
National Next Generation Science	4-LS1-a., 5-LS2-a., 5-PS3-a., 5-LS2-d
English/Language Arts	4.RI.2.4, 4.RI.4.10, 5.RI.4.10, 3.W.1.2, 3.W.3.7, 3.W.3.8, 4.W.1.2, 4.W.3.7, 4.W.3.8, 5.W.1.2, 5.W.3.7, 5.W.3.8
Health	HE.3.C.1.1, HE.4.B.4.1, HE.4.B.3.5, HE.4.C.1.1, HE.5.B.3.5, HE.5.C.1.1
Physical Education	PE.3.L.2.5, PE.4.L.2.12, PE.4.L.2.13, PE.5.L.2.12
Science	SC.3.L.14.1, SC.3.L.17.2, SC.3.N.3.2, SC.4.L.17.2, SC.4.L.17.3

4. Make copies of the *Food Groups* & *MyPlate* checklist on page 131 for evaluation — one per student.

Vocabulary: dietary guidelines, nutrients

Background Information:

Since the early days of the 20th Century, the U.S. Department of Agriculture (USDA) has made recommendations to the public about healthy diets. These guidelines are known as Dietary Guidelines and are available at www.cnpp.usda.gov/DietaryGuidelines.htm. Those recommendations have always included eating a balanced diet including all of the food groups. Today, the application of those recommendations is known as *MyPlate* and not only includes what those food groups are but also identifies proportional servings on the plate. Current recommendations are that half of the plate used in a meal should be covered with fruits and vegetables. The USDA currently recommends two to four half-cup servings of fruits and three to five half-cup servings of vegetables. Yet, despite these recommendations, we are falling far short of meeting the recommendations of eating fruits and vegetables. The lesson "*Nutrient Database*" in this book identifies specific nutritional deficiencies for girls and boys ages 12- 29. Most of these deficiencies occur because of a very low consumption of vegetables in the diet. According to the USDA, current consumption of fruits and vegetables for both adults and children is about half of the recommended levels with potato consumption making up almost a third of the vegetables consumed both at and away from home. More information is available at www.choosemyplate.gov.



Introduction:

1. Instruct the students to jot down what each had for breakfast this morning in his/her science notebook, which will take about two minutes.
2. Then have them turn and talk with their neighbor and compare their food choices.
   a. Are there any cultural differences?
   b. Historically, when humans worked hard physically, it was important that a high calorie breakfast prepared workers for the day. How is this different today? Have our breakfast choices changed?
   c. Did some students not eat breakfast? How does that affect how he or she feels? What are options to change that?
   d. Share that across the globe, even regionally within the United States, and between individuals that vary in activity level, there are great differences in choices for breakfast foods. Some cultures might choose to consume fish at breakfast, or rice, or sausage, others might have pancakes with real maple syrup in the northeastern United States or sorghum syrup in the south. Other southerners might choose to have grits. Those hiking up a mountain might have a ready-to-eat meal by adding water to a package of dehydrated food. Bikers might supplement their meal with protein bars. Others working in a heavy labor occupation might select a high energy and high protein breakfast. But someone on the run might stop at a fast food restaurant for something on the go or grab a bowl of cold cereal.
3. Ask: "How healthy do you think your choices were? Does your choice match your activity level? What might be a better choice?"

4. Explain that research indicates breakfast has a huge impact on success in school. It improves learning, reduces discipline problems, improves student behavior, improves school attendance, aids in weight control, decreases visits to the school nurse and improves attention spans in class. In addition, it sets students up for the development of lifelong healthy eating habits and results in better overall health due to better nutrition.
5. Explain that this week the class is going to keep a diary of food choices for breakfast, lunch, dinner and snacks. At the end of the week, students will chart meal choices and look at the dietary guidelines for their age group.

Activity One:

1. After introduction, provide students with *Diary of my Meal Choices* worksheet and indicate that additional copies will be available as they need them, just request a copy. Or direct students to the *MyPlate* website at www.choosemyplate.gov and click on the Super Tracker button, log in and create a profile.
2. Review worksheet or the website with students and answer any questions they may have.
3. Throughout the week, give students time to complete their worksheets or online tracker on a daily basis. Check worksheets in the morning or have students check each other to ensure that all students are logging in their data.
4. At the end of the week, pass out the *MyPlate* worksheet on page 128. Have students select one day that they felt they ate the healthiest during the week and use that day as the example.
5. Review use of the worksheet.
6. Students place their food choices under each section appropriately.
7. Have students collaboratively review their worksheets.
8. Have students reflect on their food choices and possible changes they can make to ensure a healthy diet in the future.

Activity Two:

1. Using *MyPlate* information at www.choosemyplate.gov, have students create three plates representing three meals. Ask them to include vegetables grown in the school garden on their plates.
2. Have students share or display their plates depicting healthy food choices.
3. Use the serving sizes and servings explained in *MyPlate*. Detail for each food group is provided by food group under the *MyPlate* button by viewing the food group gallery.
4. Discuss the difference between what is commonly viewed as a portion size (can vary widely) and a serving size (standardized and on the *MyPlate* website).
5. On the *MyPlate* website, have students access the "Super Tracker" section and click on the "Portion Distortion" button. Ask them to take the portion distortion quiz.

Activity Three:

1. Using the information already collected, have students create a food web that includes all of the foods they have eaten over the week and include vegetables grown in the school garden if they are not part of the food identified.
2. Discuss with students how this food web demonstrates how the geosphere, atmosphere, biosphere and hydrosphere are all components of the system that produces the food they need.
   a. Identify that plants take atmospheric carbon dioxide in and give oxygen off.

b. Identify that animals take atmospheric oxygen in and give carbon dioxide off.
c. Identify the uptake and release of water by plants and animals.
d. Identify interactions of other organisms important to the food system (bees, decomposers, nitrogen fixing bacteria, etc.).
e. Identify the role of soil and minerals found in the earth.

Evaluation Options:

1. Assess students each day for completing the daily section of their food diary (1 check per day).
2. Assess the *MyPlate* form against Food Diary for accuracy.
3. Reflection will be assessed by the *Food Groups* & *MyPlate* checklist.
4. Assess the three planning plates that each student creates, making healthy food choices for the future and including produce from the garden.
5. Ask students to create a balanced menu as a summative assessment. Use the following rubric to evaluate the success of each of their meals as balanced and representative of *MyPlate*.
6. Have students write an opinion piece detailing what the title of this lesson means to them and how it ties to the school garden. Detail actions for the future, with parental involvement, to have the healthiest diet.

Create a Balanced Meal Rubric

Category	4 Points	3 Points	2 Points	1 Points
Food Groups	Menu contains at least one example from each food group: Grains, Vegetables, Fruits, Dairy, Protein.	Menu is missing one food group.	Menu is missing two food groups.	Menu is missing three or more food groups.
Serving Sizes	All serving sizes are noted and appropriate.	Not all serving sizes are noted or may not be appropriate.	Serving sizes may not be noted or may not be appropriate.	Serving sizes are not noted or not appropriate.
Labels and Descriptions	All menu items are clearly labeled. Penmanship is neat and the presentation is organized.	Almost all menu items are clearly labeled. Penmanship is somewhat neat and presentation is organized.	Several menu items are clearly labeled. Penmanship could be improved and presentation could be more organized.	No items are labeled. Penmanship and presentation is poor.
Knowledge Gained	Student can accurately answer questions as to why their menu represents a balanced meal.	Student can accurately answer some questions as to why their menu represents a balanced meal.	Student can accurately answer more than half of the questions as to why their menu represents a balanced meal.	Student cannot answer questions as to why their menu represents a balanced meal.
Required Elements	Student followed all directions and the menu reflects those directions. Students also met time constraints.	Student followed most directions and the menu reflects those directions. Students also met time constraints.	Student followed many directions and the menu reflects the lack of those directions not followed. Student did not meet time constraints.	Student did not follow directions and the menu reflects that lack. Student did not meet time constraints.

7. Have the school cafeteria manager speak to students about how they develop the school lunch menu and what they consider to ensure students get a healthy, balanced meal.
8. Have the class work with the cafeteria manager to plan a balanced meal and promote it to other students. (Today's lunch menu was planned by Mrs. Alvarez's fourth grade class and they will be helping serve in the cafeteria.)

Extensions or Variations:

1. For kindergarten through second grade students, teachers may have students create a drawing of their breakfast or lunch meal, categorizing foods on a *MyPlate* worksheet and listen to a read aloud. See suggested book titles under resources.
2. Use the following websites as enrichment:
   - "Fruit and Veggie Champions" independent games website for ages 6 – 8 www.foodchamps.org/
   - "Readworks" website: www.Readworks.org (must register — registration free) Healthy Plates passage includes explicit information.
   - Play the games at www.eatright.org/nnm/games/#
3. Celebrate National Nutrition Month.
4. Have students research the National School Lunch Program requirements. Do they think their school cafeteria follows those guidelines? If not, what can they do to improve them?
5. Have students complete their food diaries when other work is completed, or they are writing for other students throughout the day.

Resources:

Basic breakfast learning information
www.frac.org/wp-content/uploads/2009/09/breakfastforlearning.pdf

www.frac.org/wp-content/uploads/2011/08/breakfastforhealth.pdf

www.webmd.com/food-recipes/most-important-meal

Brown, Laurie Krasny & Marc Brown. "*Dinosaurs Alive and Well: A Guide to Good Health.*" Little, Brown Books. 1992. ISBN-13: 9780316110099

Hawley, Ella. "*Exploring Food and Nutrition*." Rosen Publishing. 2012. ISBN-13: 9781448861767

Llewellyn, Claire. "*Why Should I Eat Well*?" Barrons Ed. 2005. ISBN-13: 9780764132179

Overview on breakfast
www.kidshealth.org/parent/nutrition_center/healthy_eating/breakfast.html#

Sears, William, Martha Sears, and Christie Watts "*Kelly. Eat Healthy, Feel Great.*" Little, Brown Books. 2002. ISBN-13: 9780316787086

Credits:

CPalms website
www.cpalms.org/Standards/FLStandardSearch.aspx

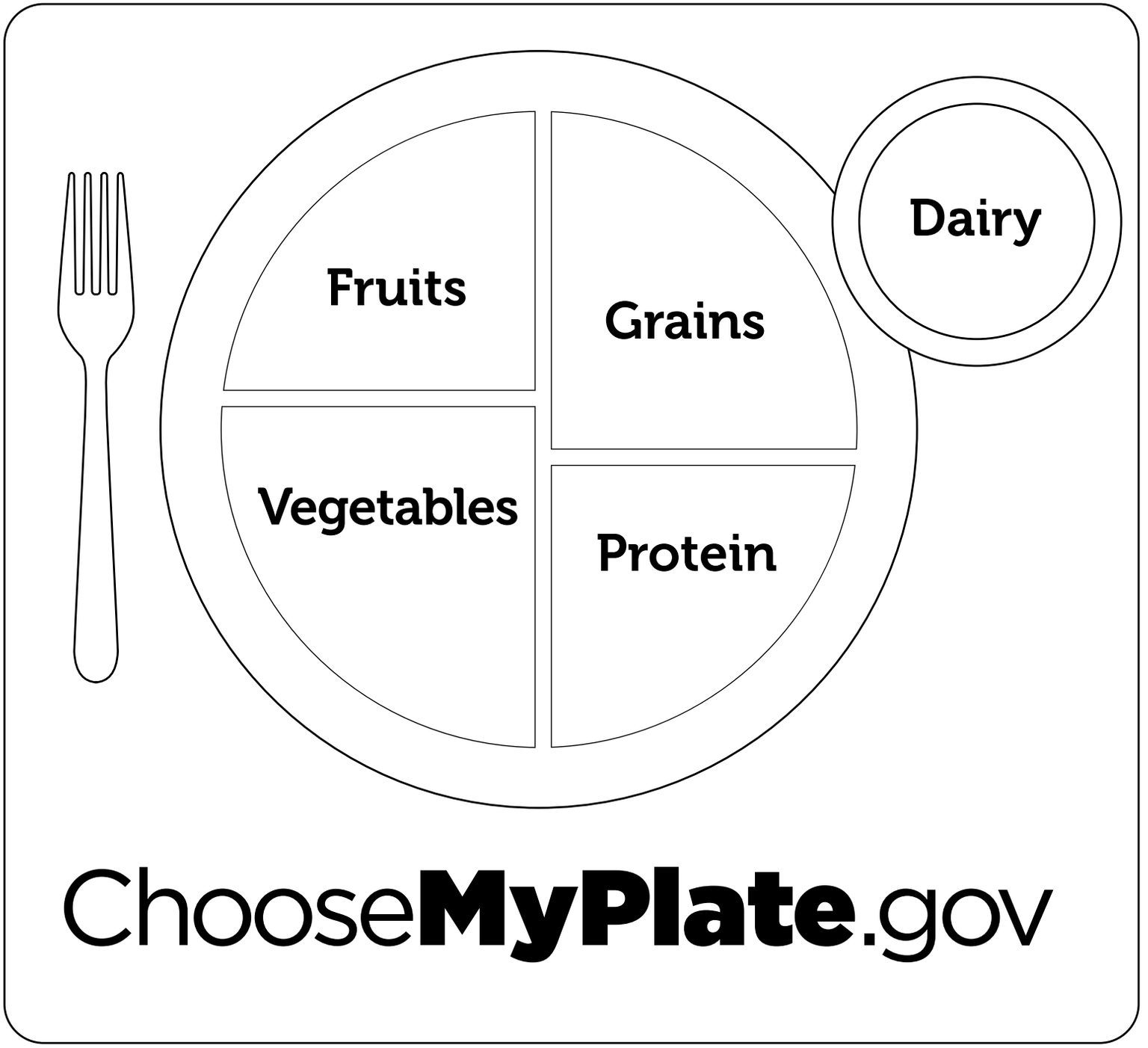
Dietary Guidelines. United States Department of Agriculture (USDA). www.cnpp.usda.gov/DietaryGuidelines.htm

MyPlate, United States Department of Agriculture (USDA). www.choosemyplate.gov

MyPlate graphic
www.choosemyplate.gov/food-groups/downloads/MyPlate/ColoringSheet.pdf

Online assessment game:
www.fns.usda.gov/multimedia/Games/Blastoff/BlastOff_Game.html

Readworks www.readworks.org



USDA Center for Nutrition Policy and Promotion

My Meal Choices

Sample Pre-Post Assessment

Give students a *MyPlate* template and have them answer these questions or perform these functions:

1. Place the foods you ate for either breakfast or lunch correctly onto the diagram.

2. What is a serving size for each of these foods?

3. Why is it important for half of the plate to be fruits and vegetables?

Diary of My Meal Choices

Name: _____ **Weekly Dates:** _____

Food choices	Average Serving	Goal	Your list of foods	Total for each group
Grains	½ cup			_____ounces
Vegetables — Whole, Canned or Fresh	2 ½ cups			_____cups
Fruits — Whole, Canned or Fresh	1 ½ cups			_____cups
Dairy	3 cups			_____cups
Protein	6 ounces			_____ounces

Food Groups & *MyPlate* Checklist

Name: _____ **Date:**_____

Check off each area completed correctly.

Student completed each section of pyramid worksheet correctly.

___ Grains
___ Vegetables
___ Fruit
___ Dairy
___ Protein

Student completed each section of *MyPlate* worksheet correctly.

___ Grains
___ Vegetables
___ Fruit
___ Dairy
___ Protein

Total _____/10

Nutrient Tally

Subjects Taught: Language Arts, Physical Education (Nutrition), Health (Nutrition), Mathematics, Science

Grade Levels: 3rd-5th Grade

Brief Description: Using the U.S. Department of Agriculture's "Nutrient Database," the students will compete to predict which vegetables or fruits grown in the school garden contain the highest levels of specific nutrients, graph the results and research the value of those nutrients to their growth and health.

Objectives: Students will:

1. Identify and quantify their nutritional needs using the electronic calculator indicated.
2. Define what various nutrients are, what they are needed for and identify the sources of the nutrients.
3. Use the U.S. Department of Agriculture's "Nutrient Database" to determine how much of specific nutrients are in produce from the school garden.
4. Compete to predict which vegetables or fruits grown in the school garden contain the highest levels of specific nutrients.
5. Graph the results of their findings.
6. Research the value of those nutrients to their growth and health.
7. Describe fat-soluble and water-soluble vitamins and make a list of which vitamins fall into each category.

Life Skills: Analyzing, assessing, comparing, compiling, evaluating, researching

Materials Needed:

- Computers with Internet access
- Copies of student handouts *What is a Nutrient?, Vitamins and Minerals,* and *It's My Choice* — one per student
- Poster board or flip chart paper
- Art supplies
- Seed catalogs, seed packets and/or grocery store flyers that can be cut apart for images of produce
- Scissors and paste or tape
- Empty vitamin and mineral containers

Time:

Introduction: 45 minutes
Activity One: 45 minutes
Activity Two: 45 minutes to research and create posters
45 minutes to view posters and complete handouts
Activity Three: one hour
Activity Four: one hour
Activity Five: 45 minutes

Preparation:

1. Ensure access to computers for students to conduct Internet research.
2. Collect and save grocery store flyers, seed catalogs and seed packets.
3. Assemble or have students bring in empty vitamin and mineral supplement containers.

Vocabulary: Carbohydrates, database, lipids, minerals, nutrients, protein, vitamins

Background Information:

The U.S. Department of Agriculture (USDA) has a science-based listing of the nutritional composition of foods in one

Florida Standards Met At-A-Glance

English/Language Arts	4.RI.2.4, 4.RI.4.10, 5.RI.4.10, 3.W.1.2, 3.W.3.7, 3.W.3.8, 4.W.1.2, 4.W.3.7, 4.W.3.8, 5.W.1.2, 5.W.3.7, 5.W.3.8
Mathematics	3.MD.2.3
Physical Education	PE.3.L.2.5
Health	HE.3.B.1.4, HE.3.B.4.2, HE.4.B.1.4, HE.4.C.1.1, HE.5.B.1.4, HE.5.B.4.2, HE.5.C.1.1

centralized location in USDA's "Nutrient Database" available at www.ndb.nal.usda.gov/. The database is searchable, contains both raw foods and processed foods, continues to expand as foods are created or altered and even has foods from specific restaurant chains. Foods are given in portion sizes but vary between grams, cups, whole vegetables, other raw forms and restaurant servings. Few students ever learn what specific nutrients a food source provides because we fail to teach them. Limiting knowledge to food groups and portion sizes handicaps students and limits their understanding of proper nutrition. The major focus of this lesson is to help students understand that there is a wealth of science-based information available from an easily accessible, up-to-date, credible source.

Introduction:

1. Make a list of all the fruits and vegetables being grown in the school garden. Ask the students to add their favorite foods to this list. Post the list in a visible place.
2. Review serving sizes for various foods on page 38 of this book or at the Food and Nutrition Service of the USDA at www.fns.usda.gov/tn/healthy/portions_kit/serving_size.pdf or in the appendices of *Project Food, Land & People's Resources for Learning*.
3. Add the size of one serving to each of the foods listed on the posted summary.
4. Ask students if they know what vitamins are. Ask them to tell you what they are and where we get them from. *(Many students may suggest that we get them by taking a vitamin pill, but beyond that may not realize what they are, how important they are or how we obtain them.)*
5. If the students do not state that we get vitamins from the foods we eat and drink, lead them in that direction. Share with them that the vitamin and mineral supplements in a pill, that are manufactured in a laboratory, originate from a food source. Assure them that all nutrients come from food. Explain that this lesson will help them understand which foods provide specific nutrients and why students need those nutrients.

Activity One:

1. Explain to students that all foods have varying nutritional values. We are constantly being told to eat more fruits and vegetables but not being told why that is so important.
2. Have students research what the major nutrients are, describe why we need them and complete the *What is a Nutrient? Student Handout* using the National Library of Medicine at the National Institutes of Health Web site at www.nlm.nih.gov/medlineplus/encyclopedia.html. For younger students, you may wish to assign this as a small group activity with one group of five students completing a single handout as a group effort.

Activity Two:

1. Assign students in groups of twos or threes to research a single vitamin or mineral needed by the body and create a poster project about that vitamin or mineral using the same website and a second science-based website such as the Vitamin and Mineral Fact Sheets at the National Institutes of Health at www.ods.od.nih.gov/factsheets/list-VitaminsMinerals/ or Vitamins and Minerals at Nutrition.Gov at www.nutrition.gov/whats-food/vitamins-minerals.
2. Display the completed posters around the classroom.
3. Have the class members view the posters and complete the *Vitamins and Minerals* handouts. Make sure the class covers all the vitamins and minerals and reports on each to the class.
4. Review what the nutrients are, why we need each and what foods contain those nutrients.

Activity Three:

1. Using the seed catalogs, seed packets, and/or store flyers, have the students select a vegetable ***not*** grown in the garden and walk the students through using the "USDA Nutrient Database" at www.ndb.nal.usda.gov/.
2. Explain to students that now they will put what they have learned to work in a competition.
   a. Referring to the list of produce from the garden (developed in the introduction), ask the students to select one produce item that contains the greatest

number of nutrients overall. Now select a specific nutrient and a second item that contains the greatest amount of that nutrient.

   b. Indicate that these are their choices for the competition to see whose choices have the greatest number of nutrients and the greatest amount of nutrients total.
   c. Enter those selections on the *It's My Choice Student Handout*.

3. Have students use the USDA Nutrient Database at www.ndb.nal.usda.gov to assess their selections and list results on the *It's My Choice Student Handout*.
4. Have the students graph their results and post the graphs.
   a. Students should produce two graphs for each food choice. One graph should include carbohydrates, protein, and lipids (fats and oils). These are the macronutrients.
   b. The second graph for each food choice should include vitamins and minerals. These are the micronutrients.
5. Give each nutrient one point and add up the number of points for the variety of nutrients. The food that has the highest number of points is the winner of the category for most number of different nutrients.
6. Give each nutrient a point for the amount of that nutrient in whatever measure it is given in (it will vary based on recommended amounts and whether it is a macronutrient or a micronutrient).
   a. For example: a carbohydrate may have 4 grams in a vegetable while the vitamin amount may be 7 micrograms in the same vegetable. Each amount receives 1 point so the total for that vegetable is 4 points +7 points =11 points.
   b. While this may seem like comparing apples and oranges, we need macronutrients in large amounts, and micronutrients in very tiny amounts. But both are essential to our well being and should be given equal importance.
   c. The food that has the highest number of points is the winner of the category for most total nutrients.
7. Compare the results for both categories, and select the winner.

Activity Four:

1. Using the "Interactive Daily Nutrient Recommendations" for dietary planning at the Food and Nutrition Information Center of the USDA at www.fnic.nal.usda.gov/fnic/interactiveDRI/ have students submit their information and calculate their nutritional requirements for all categories possible. Make sure they check all of the individual nutrient boxes.
2. Have students either print off the information for their own personal use or copy and paste the information into their own document to save for future reference in their own electronic file. This will be used for several lessons.
3. Make a list of five fruits and five vegetables that will meet some of the needs you may have for vitamins and minerals.

Activity Five:

1. Have students examine the labels of various vitamin and mineral supplement labels to assess the amount of various nutrients in each. Compare multivitamin brands.
2. Ask students:
   "Why are multivitamins taken? What do they provide or ensure?" *(If nutrients are not consumed in foods, they can be provided by vitamin and mineral supplements.)*
3. Have students research the difference between fat-soluble vitamins and water-soluble vitamins and make a list of which vitamins fall into each category.
4. Ask the students if it is possible to have too little or too much of a nutrient such as a vitamin. Explain that yes it is. Both too little and too much of certain nutrients can be a health problem. Too little of nutrients can cause deficiency disorders. Too much of some nutrients can be toxic. For example, too much of the water-soluble vitamins will be excreted in the body's urine. Fat-soluble vitamins are retained by the body and can become toxic.
5. Discuss with students whether or not they need vitamin and mineral supplements if they do not eat a well balanced diet. If so, how much? If they eat a balanced diet, do they need vitamin and mineral supplements? *(Answers will vary, and the questions are just posed to be thought provoking.)* Explain that foods contain more than nutrients and that when eaten provide phytonutrients. Much of this is still being researched and it is best to get nutrients from foods rather than supplements to ensure that the body obtains everything good in foods which may be missing in supplements.

Evaluation Options:

1. Assess student performance in completing the assigned research and cooperation in completing the group

work, including accuracy and completeness on the three handouts.

2. Assess the small-group work on creating the poster project for accuracy, completeness, participation of all students, creativity in presenting the information and ability to clearly understand the presentation.
3. Assess student work and graphs for accuracy and completion.
4. Have students use their nutritional requirements (found in activity four) and the USDA Nutritional Database to create a week-long menu of healthy meals that will incorporate produce from the garden to meet their nutritional and serving size requirements identified in the introduction activity.
5. Have students write an essay on why they need to consume a wide variety of foods that include fruits and vegetables including a creative way to include a vegetable that they selected in the competition.
6. Have students select a color of vegetable. Make a list of the vegetables in that color and research nutrients found in the category to evaluate similarities.

Extensions or Variations:

1. Have the school cafeteria manager speak to the class about incorporating fruits and vegetables into the school lunch program.
2. Give students that selected the produce item with the most nutrients and most of a single nutrient an A + or 100 percent score for the activity.
3. Have students select a nutrient found in a supplement, identify the foods that provide that nutrient and identify what other nutrients are provided by that food.
4. Have students research and write about supplements.
5. Have students research the statement, "The dose makes the poison," and write an essay explaining it.

Resources:

Food and Nutrition Service, United States Department of Agriculture. www.fns.usda.gov/tn/healthy/portions_kit/serving_size.pdf

"Interactive Daily Nutrient Recommendations", Food and Nutrition Information Center of the United States Department of Agriculture. www.fnic.nal.usda.gov/fnic/interactiveDRI

National Library of Medicine, National Institutes of Health. www.nlm.nih.gov/medlineplus/encyclopedia.html

Nutrient Data Laboratory, United States Department of Agriculture. www.ars.usda.gov/main/site_main.htm?modecode=12-35-45-00

USDA Nutrient Database, United States Department of Agriculture. www.ndb.nal.usda.gov

Vitamin and Mineral Fact Sheets, National Institutes of Health. www.ods.od.nih.gov/factsheets/list-VitaminsMinerals

Vitamins and Minerals, Nutrition.Gov. www.nutrition.gov/whats-food/vitamins-minerals

Nutrient Tally

Sample Pre-Post Assessment

1. What are five nutrients needed by the human body?

2. List one vegetable or fruit that is high in vitamin A.

3. List one fruit or vegetable that is high in vitamin C.

4. Give one reason why getting your nutrients by eating fruits and vegetables is important to your health.

What is a Nutrient? Student Handout

Name _____

Using the National Library of Medicine searchable website at http://www.nlm.nih.gov/medlineplus/encyclopedia.html, search for each nutrient and find this information:

Nutrient	Needed For	Deficiencies Result in	Sources
Protein			
Carbohydrates			
Vitamins: A, D, E, K, C and the B Vitamins			
Minerals: Calcium, Phosphorus, Iron, Magnesium, Sodium, Potassium, Chloride, Iodine, Zinc			
Fats and Oils (Lipids)			

Vitamins and Minerals

Nutrient		Needed For	Deficiencies Result in	Sources
Vitamins	A			
	D			
	E			
	K			
	C			
B Vitamins:	Thiamin			
B Vitamins:	Riboflavin			

Vitamins and Minerals
Continued

Nutrient		Needed For	Deficiencies Result in	Sources
B Vitamins:	Niacin			
B Vitamins:	B-6			
B Vitamins:	Folate			
B Vitamins:	Pantothenic Acid			
B Vitamins:	Biotin			
B Vitamins:	B-12			

Vitamins and Minerals
Continued

Nutrient		Needed For	Deficiencies Result in	Sources
Minerals	Calcium			
	Phosphorus			
	Magnesium			
	Sodium			
	Potassium			

Vitamins and Minerals
Continued

Nutrient		Needed For	Deficiencies Result in	Sources
Minerals	Chloride			
	Iron			
	Iodine			
	Zinc			

It's My Choice

Name _____

1. Identify the garden produce that you believe contains the greatest number of total nutrients:

_____

2. List the nutrients found in this fruit or vegetable:

3. The Total Number of Nutrients= _____

4. Select one fruit or vegetable that contains the most of a single nutrient and identify the nutrient.

Fruit or Vegetable Selected	Nutrient Selected	Amount of the Selected Nutrient

What We Eat - Part 2

Subjects Taught: Science, Nutrition, Language Arts

Grade Levels: 3th-5th Grade with extensions for 6th-12th Grade

Brief Description: Students will sort fruits and vegetables (by examining plants grown in the school garden, purchased in the market, or featured in models or pictures) into the parts of the plant eaten as food, identify a serving size, and locate where on *MyPlate* the food belongs. Understanding the food storage function of a specific plant part will aid in understanding the nutrition provided by that plant part.

Objectives: Students will:

1. Identify the parts of the plant.
2. Sort fruits and vegetables by plant part.
3. Place sorted fruits and vegetables on *MyPlate*.
4. Describe and provide a general explanation of the nutrients provided by fruits and vegetables.

Life Skills: Analyzing, applying, collaborating, comparing similarities and differences, contrasting, categorizing, identifying, observing, sharing observations, sorting and understanding cause and effect

Materials Needed:

- Fruits and vegetables from the school garden, pictures of fruits and vegetables, models of fruits and vegetables and/or purchased fruits and vegetables
- Copies of student handout *Parts of the Plant* – one per student
- Copies of student handout *What We Eat 1* – one per student
- Nuts in the Shell and a Nut Cracker
- Paper towels, newsprint, craft paper or brown paper such as that of a paper shopping bag
- Large wooden dowel, wooden mallet or rolling pin
- White flour (Optional: whole wheat flour)
- Water
- Grocery store advertisements with fruits and vegetables listed and pictured

Time:

Activity One: 45 minutes, plus time for student work
Activity Two: 45 minutes
Activity Three: 30 -40 minutes
Activity Four: 30 minutes
Extensions: 45 minutes each activity

Preparation:

1. Decide what portion of the background information is appropriate for your students.
2. Make copies of student handouts.
3. Collect grocery store flyers and seed catalogs for pictures.

Florida Standards Met At-A-Glance

National Next Generation Science	(Extensions: MS-LS1-j., MS-LS2-f., MS-LS2-b., HS-ESS3-a.)
English/Language Arts	3.W.3.7, 4.W.3.7, 5.W.3.7, 3.W.3.8, 4.W.3.8, 5.W.3.8, 68.WHST.2.4, 68.WHST.3.7, 68.WHST.3.8, 68.WHST.3.9, 3.SL.2.4 , 4.SL.1.2 , 4.SL.2.4, 5.SL.1.1, 5.SL.1.2, 5.SL.2.5, 6.SL.1.1
Physical Education	PE.1.L.2.8, PE.2.L.2.11

Vocabulary:

Carbohydrate, flower, fruit, leaf, leaf petiole, minerals, oils, protein, root, starch, stem, sugar, vitamin

Background Information:

What are we eating? Is it a root? Is it a stem? Is it a leaf? Is it a fruit? Is it a seed? Is it actually a vegetable? Few adults could answer correctly. Some of the confusion is due to common use terminology versus the correct scientific designation between what a fruit is and what a vegetable is. If a food is sweet or served as dessert, we have considered it a fruit. Actually there is a scientific botanical designation of fruits. In laymen's terms, if it has a seed or is a seed, it is, botanically, the fruit of the plant. So, grains are plant fruits. Tomatoes are plant fruits. Cucumbers, squash, and pumpkins are all plant fruits.

So what are vegetables? Vegetables are the vegetative and reproductive part of the plant before they bloom and set fruit and seed.

Vegetables are:

Leaves: Head lettuce, leaf lettuce, cabbage, spinach, bay leaves, oregano, sage, parsley flakes, basil, rosemary, thyme, tea, dill weed, cilantro, mint
Modified Leaves: Onions, celery, Brussel sprouts, garlic
Flowers: Broccoli, cauliflower, artichoke, cloves, saffron
Stems: cinnamon, asparagus
Modified Stems: Potatoes, turnips, ginger
Roots: Carrot, beets, parsnips, sweet potatoes, radish, turmeric

Botanical Fruits are:

Almonds, apples, bananas, barley, beans, black walnuts, blueberries, Brazil nuts, cacao (source of chocolate), cantaloupes, cashews, cherries, coconuts, cola nuts, corn, cucumbers, currents, dates, figs, gooseberries, grapes, hazelnuts, hickory nuts, lemons, limes, mangoes, oats, oranges, peaches, peanuts, peas, pecans, peppers, plums, pumpkins, raspberries, rye, snow peas, sorghum, squash, sweet corn, strawberries, tomatoes, walnuts, watermelons, wheat

Spices from Botanical Fruits:

Allspice, chili powder, caraway, cardamom, coriander, dill seed, mace, mustard, nutmeg, paprika, pepper, vanilla

Of course, it isn't always so simple. Strawberries, commonly considered a fruit, are the one major exception from a scientific perspective. The fruit is actually the seed on the outside of the strawberry. The sweet, juicy portion we eat is actually a vegetative holder of the seeds and not truly a fruit.

For some food plants, both the fruit and vegetative portions are used. This is true with dill. The leaves are used as dill weed, the immature flower heads are used as a flavoring in dill pickles. Thus, these are vegetative. The dill seed (fruit) are also used in making dill pickles and as a spice. The leaves of the cilantro plant are used in Mexican cooking as an herb (vegetative) but when the plant develops seed (fruit) it is used as a spice and known as coriander.

And even politics or the law sometimes intervenes causing more confusion. In 1883, the Supreme Court ruled that tomatoes should be considered a vegetable for tax purposes. The U.S. Congress passed the Tariff Act of 1883 which imposed a 10 percent tariff on all imported vegetables. So, the tax collector in New York harbor was collecting tax on tomatoes as a vegetable. Fruit importers, the Nix brothers, sued to retrieve back taxes claiming that tomatoes should be considered fruit and therefore not taxed. The court denied the claim and tomatoes were legally determined to be vegetables regardless of science. Tax is still paid today on imported tomatoes. This lesson will be straightforward in most applications and will only explore the more confusing aspects of this topic as an enhancement for older students.

The nutrition of various fruits and vegetables is directly related to the plant structure and purpose of that portion of the plant. For example, seeds need a great deal of energy to sprout and push through the soil to reach the light. Concurrently, each seed produces roots that reach down into the soil seeking moisture and nutrients. In order to accomplish these feats, the seed must be a storehouse of energy. So seeds store carbohydrates and lipids (fats and oils). Fats and oils contain more than twice the calories of carbohydrates and protein, gram for gram. A gram of protein or a gram of carbohydrate contains 4 calories. While a gram of lipid (either fat or oil) contains about 9 calories. That extra energy is needed for germination. Seeds also need protein to form the structure of the new plant prior to it being able to conduct photosynthesis and create new protein. So, a seed contains oil or fat, protein, and carbohydrates in the form of starch and cellulose. All of our major grain crops are seeds - corn, wheat, rice, oats, barley, rye, quinoa and soybeans. Some crops are raised primarily for oil production such as rapeseed used to produce canola oil. All of our nuts are seeds.

Vegetative parts of the plant contain cellulose or in some cases lignin, which provides strength to the structure of the plant. Humans cannot digest cellulose or lignin so this provides us with fiber. The vegetative parts of the plant are the operation centers. Photosynthesis takes place in the leaves and stem.

Transportation occurs in the roots and stem. Venation take places in the leaves. Food storage happens in the leaves, stem and roots, depending on plant, which is where sugars, starches, vitamins and minerals are found.

Introduction

1. Review with students the parts of the seed and the process of seed germination. If this hasn't been taught, a good website to use is the Arizona Cooperative Extension Master Gardener's site at *www.ag.arizona.edu/pubs/garden/mg/botany/seeds.html*.
2. Review photosynthesis as appropriate. At minimum, younger students should be able to explain that plants produce food by capturing the energy of sunlight and that all food begin with plants.
3. Either collect grocery store flyers or ask students to bring in grocery store flyers that contain fruits and vegetables from the newspaper.

Activity One:

1. Read the book *Tops and Bottoms* by Janet Stevens. Ask: "What difference would it have made if bear knew more about the plants in the garden?" Explain that this is the exploration we will be conducting.
2. Provide students a copy of the handout *Parts of the Plant* and using plants in the school garden, have students label the roots, leaves, flowers, and stem.
3. Explain that the roots take in water and nutrients, the stem helps transport those nutrients and water up to the leaves and flowers, the leaves take in sunlight and air (CO_2 during the day and O_2 at night) and produce first sugar and then that sugar is converted into starch, protein, fats, cellulose and lignin. Those byproducts are where food begins.
4. Explain that plants store food for the following reasons: survive a dormant period such as winter; survive a dry time of year if the plant lives many years; store food for the following season; produce offspring through seeds; or produce offspring by another structure such as a rhizome, tuber or corm. Explain that how plants store food affects what nutrients are in that food.
5. Have students brainstorm all fruits and vegetables or foods made with fruits and vegetables that they can think of and make a list in a visible place. They may need assistance with this. Begin with the fruits and vegetables grown in the school garden. Make a "T chart" with fruits on one side and vegetables on the other and place fruits and vegetable on the chart where students believe they belong.
6. Explain that true vegetables are the vegetative part of the plant – leaves, roots, stem and flowers. From a scientific perspective, if it has seeds or it is a seed it is the plant fruit – even if it is commonly called a vegetable. This means that sweet corn, beans, squash, cucumbers, eggplants, peppers, peas, watermelon, cantaloupe and pumpkins are, scientifically speaking, all fruits.
7. Using copies of student handout *What We Eat 1,* help students place foods into the categories for leaf or leaves, stem, roots, and flowers. (For younger students, roots will serve as tubers, rhizomes, corms and bulbs. For older students, only true roots should be placed here.) Use the list found in the background information.
8. Move items on the "T chart" to represent where they truly belong by asking students what part of the plant the fruits and vegetables represent from a scientific point of view.
9. Examine plants from the garden to view food storage.

Activity Two:

1. Read a seed book such as the *Carrot Seed* by Ruth Krauss to the class.
2. Show students the nuts in a shell (almonds walnuts, hazelnuts, etc). Explain that these are the seeds of specific trees and the seed would have to germinate through the shell to grow. Have students see if they can break apart the nuts with their bare hands.
3. Discuss how hard the nut shells are and ask how much energy it would take to germinate.
4. Using the nut cracker, break open the nuts, show students the nut meat (seed) inside. Using either a mallet or large wooden dowel or rolling pin crush the nut meat on the brown paper or paper towel. Have the students feel the oil and view the oil stain on the paper.
5. Explain that the seed contains oil and that oil has a lot of energy. The same is true with other seeds but to a lesser degree.
6. Ask what else the seed has. It has starch. Show students white flour and explain that it comes from a wheat seed and much of what they see is starch. But there is more.
7. Make a thick paste using about ¼ - ½ cup of flour and three teaspoons of water –add more water as needed by single tablespoon. Work it into dough until it is very stretchy. This takes time. Stretch it out and explain that the part of the flour (from wheat seed) that makes the dough stretchy is gluten, which is the protein part of the wheat seed. Some people have trouble eating wheat products such as bread and it is the gluten that they cannot digest.
8. Ask: "Now we know that seeds contain oils, starches and protein, how many seeds or foods from the seeds can we name?" Have students brainstorm all of seeds or foods

from seeds they can think of and make a list in a visible place. Younger students may work together as a class or in small groups.
Wheat: *bread, egg noodles, pizza crust, crackers, cereals, spaghetti, muffins, cakes, cupcakes*
Corn: *corn tortillas, corn chips, corn flakes, corn puffs, corn cereals like Captain Crunch; corn oil*
Oats: *oatmeal, Cheerios, Honey Bunches of Oats, Granola, oat cakes*
Soybeans: *Edamame, tofu, soy nuts, soymilk, vegetable oil*
Rice: *rice, puffed rice cakes, Rice Krispies, many of the Chex cereals, Rice-a-Roni, rice pudding*
Coconut *(can be a fruit, nut or seed, but botanically it's a one-seeded drupe)*
Cacao *(chocolate) (seed of the fruit thought of as a culinary nut)*
Nuts in a shell *(botanically defined as a fruit composed of a hard shell and a seed)*
Peanuts *(botanically defined as a seed from a legume plant)*

9. Ask: "Where do these foods fit in *MyPlate*?"
10. Have the students count the number of seed crops that are grown in the school garden or if none, count the number of foods eaten during a day that come from or are products of seed crops (flour, oil, seeds, flavorings, etc.)
11. Have students create their own diorama, poster or illustration depicting their favorite vegetables including one from each part of the plant.

Activity Three:

1. Now that we know what part of the plant specific foods come from, let's discuss how that impacts nutrition. We already know that seeds have oils, starches and protein.
2. Vegetative parts of the plant – leaves, stems, immature flowers, leaf petiole – all true vegetables – contain fiber (cellulose), water, vitamins and minerals.
3. Storage structures that are vegetative – tubers, true roots, modified leaves, corms and rhizomes have to store energy. But unlike seeds these plant parts store energy as starch or sugar. So potatoes (tuber-a modified stem); carrot, beets, sugar beets, parsnips, sweet potatoes (true roots); and onions, Brussels sprouts, garlic (modified leaves) provide carbohydrates as nutrients. They also provide vitamins and minerals.
4. Ask: "Where do these foods fit in *MyPlate*?" Have the students place foods.
5. Ask: "What is a serving size for fruits, vegetables, and a food made from seed such as bread?" Discuss using the recommendations at www.choosemyplate.gov/

Evaluation Options:

1. Assess student work on the two handouts for accuracy and completion.
2. Using grocery store flyers, have students create their own *MyPlate* meal that includes fruits and vegetables, and carbohydrate foods such as bread, pasta, rice, or noodles, meat, and milk. In addition, have students identify serving sizes and cost to purchase the food.
3. Have students identify foods from leaves, roots, flowers, and/or stems that are grown in the school garden and place them into categories for leaves, stems, roots, flowers and seeds.
4. After lunch, have the students categorize the foods in the school lunch into parts of the plant.

Extensions and Variations:

1. Enlist the assistance of the school cafeteria to include kid-friendly vegetables in the school meal. Ideas can be found at www.choosemyplate.gov/food-groups/downloads/TenTips/DGTipsheet11KidFriendlyVeggiesAndFruits.pdf.
2. During Activity One, step 1, explain that some leaves attach directly to a plant stem and other leaves have another stem that connects the leaf to the stem and that this is called the leaf petiole. This is important to explain why some vegetables are not actually plant stems but actually leaf petioles such as stalks of celery. Use the second, more detailed chart *What We Eat 2* to complete this activity.
3. Have students create a food web using the plants in the garden that include humans and organisms from both above ground and below, decomposers, pollinators and consumers. Have them create labels indicating each, flow of energy, flow of nutrients, etc.
4. Have students play the interactive Blast off On-Line at www.fns.usda.gov/multimedia/Games/Blastoff/BlastOff_Game.html.
5. Use the lesson *Fruits or Veggies* from *Project Food, Land & People's Resources for Learning*, which is available at www.faitc.org.

Extensions for Middle and High School students:

1. Use the lesson specifically developed for teaching biology to middle school and high school students *What Part of the Plant Do We Eat?* at *www.serendip.brynmawr.edu/sci_edu/waldron/*.
2. Use the lesson *Lunchtime Favorites* from *Project Food, Land & People's Resources for Learning*.
3. Have high school students research the composition of flax seeds (amount of fats and composition of fatty

acid make up of those fats) at www.flaxasia.net/new_nutritional%20makeup%20of%20flaxseed.html.

4. For challenging vegetables that are not readily identified as modified leaves or stems, have the students dissect celery and green onions. When celery stalks are stripped away, the center of the plant can easily be seen as the stem and the stalks of celery seen as the leaf petioles. And if an onion, green onion is best, is dissected in half lengthwise it is easy to see that the bulb of the onion is made of leaves.
5. Take the *Nutrition Voyage: The Quest to be Our Best* at www.fns.usda.gov/tn/Resources/nutritionvoyage.htm.
6. Have students research origins of food, impact of climate on the types of foods produced and the subsequent influence on culture and foods associated with that culture. (For example: cold, wet, Northern climates are unable to grow many crops. They can produce an abundance of cabbage, beets, cauliflower, and early spring grains such as barley, rye and oats. Eastern European cultures developed sauerkraut, borscht and rye bread. While warm, wet, tropical climates can produce tea, coffee, cocoa, rice, sugar, most of our spices and citrus. Indian and southern Asian cultures developed spicy foods, sweet and sour dishes, rice dishes, and most of the beverages commonly consumed around the world – tea, coffee, cola, chocolate.) A good source of information for student research is the Food Timeline at www.foodtimeline.org/index.html.

Resources:

Arizona Master Gardeners, Arizona Cooperative Extension, www.ag.arizona.edu/pubs/garden/mg/botany/seeds.html

Florida Master Gardeners, University of Florida Cooperative Extension, www.gardeningsolutions.ifas.ufl.edu/giam/index.html

Food Timeline. www.foodtimeline.org/index.html

Krauss, Ruth. *The Carrot Seed*. HarperCollins. 2004 (60th anniversary edition) ISBN-13: 9780064432108

MyPlate, United States Department of Agriculture, www.choosemyplate.gov/

Stevens, Janet. *Tops and Bottoms*. Houghton Mifflin Hartcourt. 1995. ISBN-13: 978015292513.

What We Eat

Sample Pre-Post Assessment

1. Name one vegetable that we eat that is a root:

2. Name a leaf that we eat:

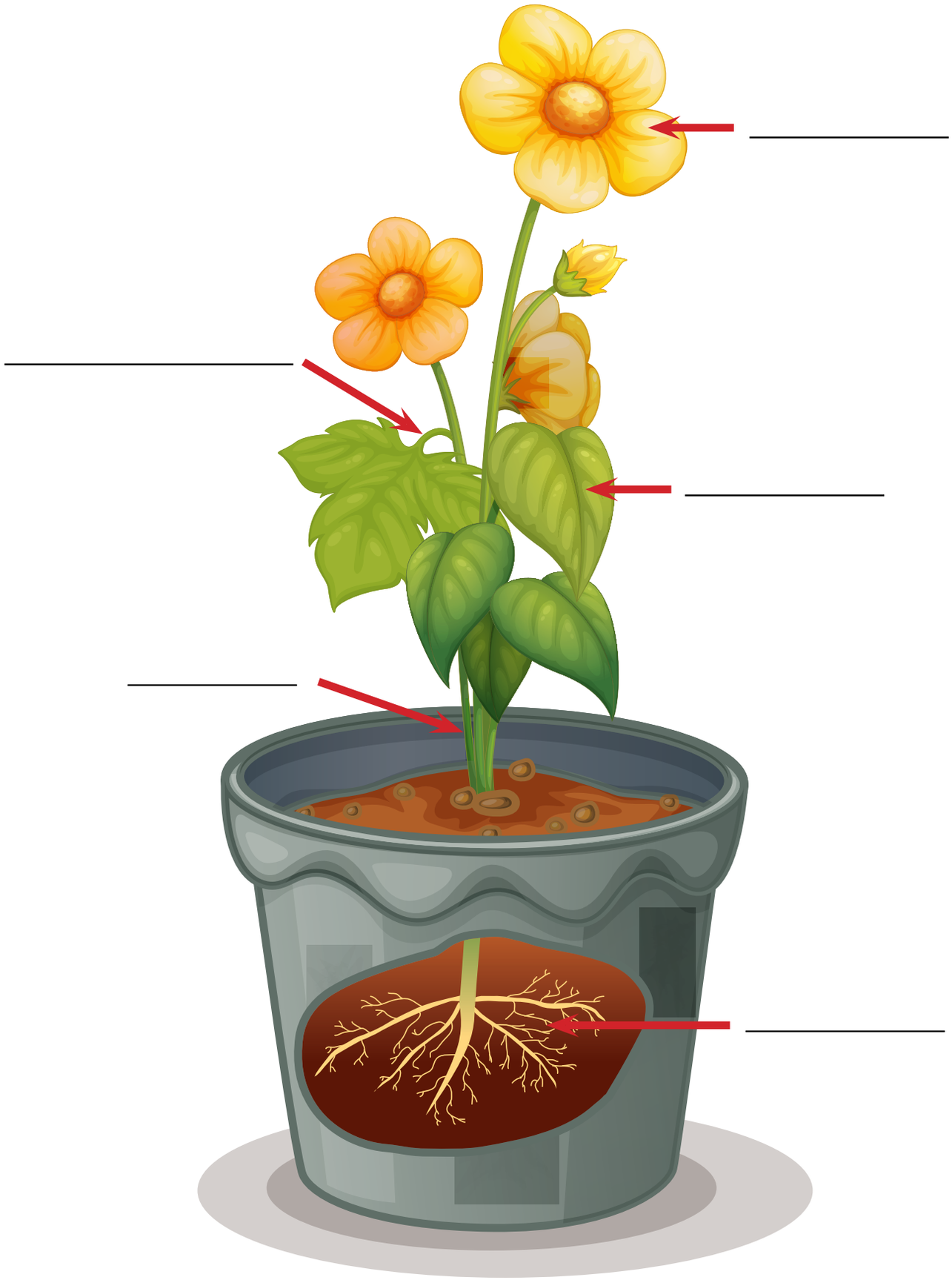
3. What are three foods made from seeds?

4. What plant part used for food contains oils and protein?

5. From how many plants in the school garden will plant fruits be harvested for food?

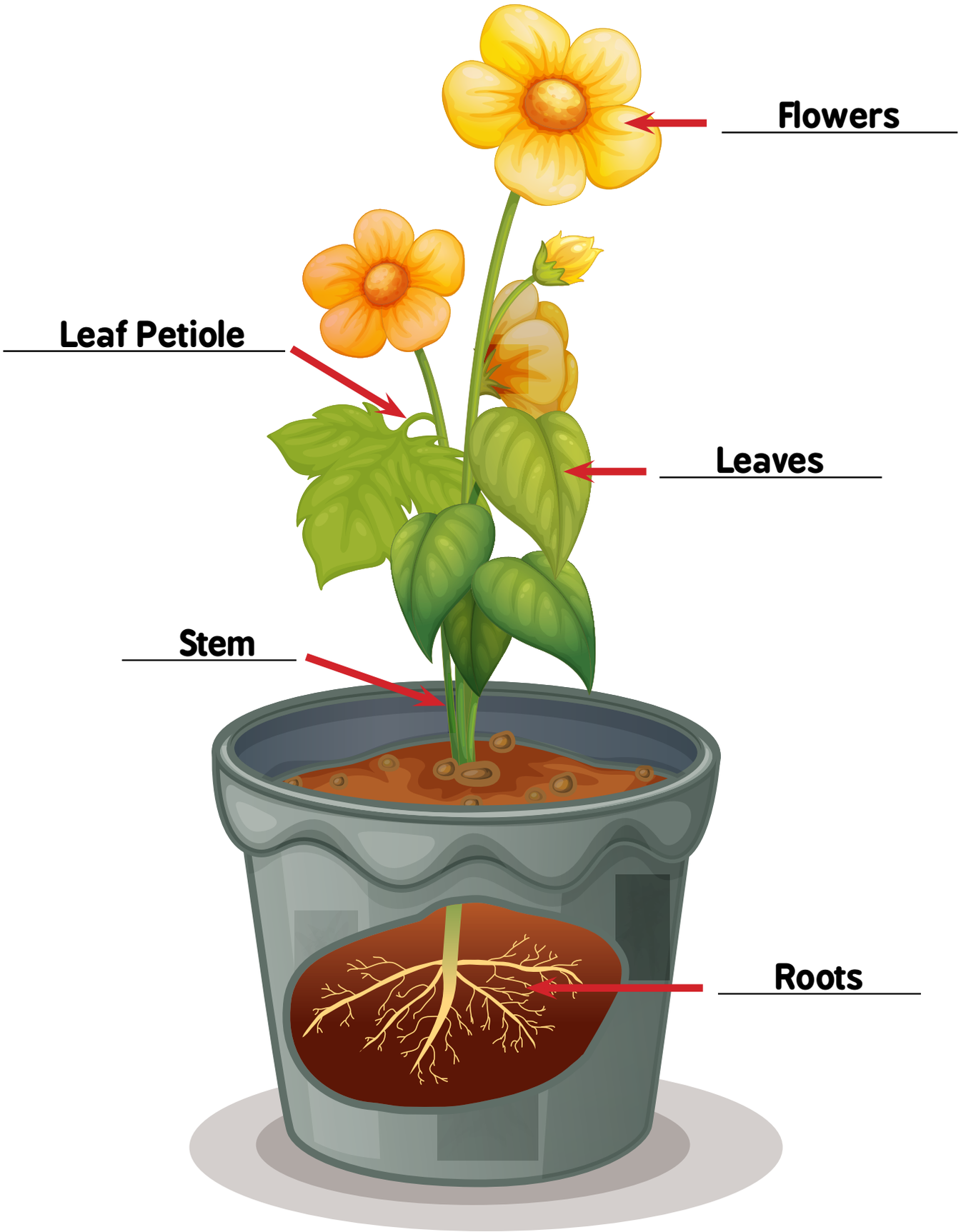
Parts of the Plant

Name:_____



Parts of the Plant

Name: Answer Key



What We Eat 1

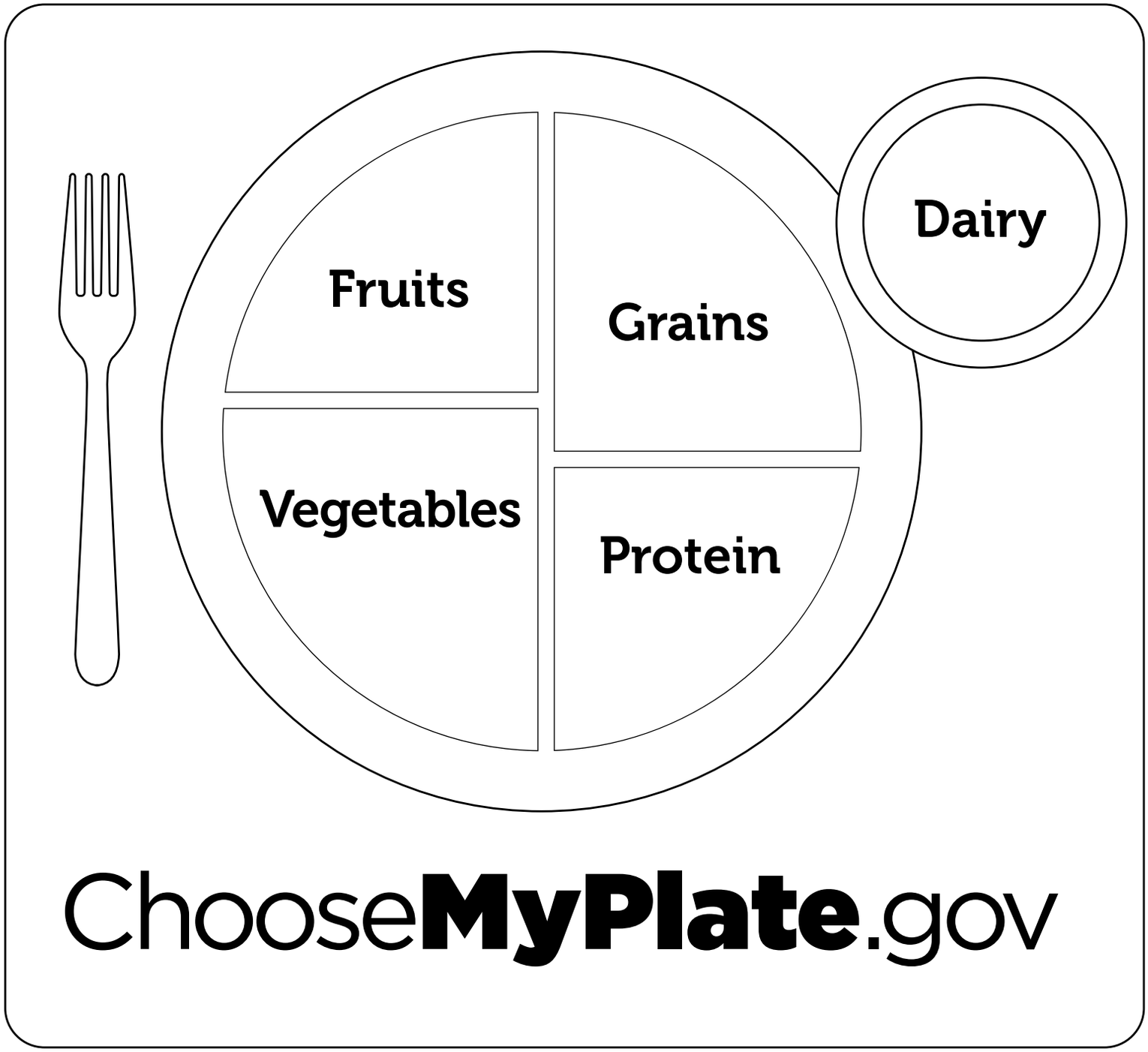
Name _____

Leaf /Leaves	Flowers	Stems	Roots	Seeds

What We Eat 2

Name _____

Leaf /Leaves	Leaf Petiole	Modified Leaves	Flowers
Seeds	**Stems**	**Modified Stems**	**Roots**



USDA Center for Nutrition Policy and Promotion

Salad Rap - Part 2

Subjects Taught: Music, Language Arts, Physical Education, Nutrition

Grade Levels: 3rd - 5th Grade

Brief Description: Students create a rap song or chant and dance containing and promoting the components of their favorite salad as well as use chant as a device to remember that plants do not eat and only plants produce food.

Objectives: Students will:

1. Learn a rap song about rain as a device to introduce the topic and teach accompanying motions.
2. Create a rap song describing the vegetables in a salad (that may be growing in the school garden.)
3. Create a dance or motions to accompany the rap song.
4. Identify servings and categories of the vegetables within the rap song.
5. Include the differences between meeting their nutritional needs in the song versus what they may want to have as a treat.

Life Skills: applying, creating, describing, rhyming, sorting, speaking in public, writing

Materials Needed:

- Magazines or seed catalogs that can be cut apart
- Grocery store flyers
- Paper, pen and/or pencil
- Copies of *Salad Rap Student Handout* – one per student

Time:

Introduction: 15 minutes
Activity One: One hour
Activity Two: One hour

Activity Three: One hour
Practice: 10 minutes per day over several days
Performance time: Two minutes

Preparation:

1. Visit the following websites to familiarize yourself with teaching children how to use rap music to teach poetry writing and specific techniques useful at all ages:
   Raps for Kids, My Word Wizard at www.mywordwizard.com/raps-for-kids.html
   Cheers, Chants, Raps, and Poetry, Songs for Teaching, www.songsforteaching.com/chantsraps.htm
   The Hip Hop Handbook, Academic Entertainment at www.academicentertainment.com/hiphop
2. Examine and if desired make copies of age appropriate Rhyming Worksheets to facilitate the process at www.education.com/worksheets/rhyming

Vocabulary: Chant, rap

Florida Standards Met At-A-Glance

National Next Generation Science	K-LS1-1, 2-LS4-1
English/Language Arts	K.W.1.2, K.W.1.3, K.W.3.8, 1.W.1.3, 1.W.3.8, 2.W.1.3, 2.W.3.7, 2.W.3.8, K.SL.2.4,1.SL.1.2, 1.SL.2.4, 2.SL.1.2, K.L.3.5, K.L.3.6, 1.L.3.5, 1.L.3.6
Social Studies	SS.K.E.1.4, SS.K.G.1.1, SS.2.E.1.2
Physical Education	PE.1.L.2.8, PE.2.L.2.11

Background Information:

Connecting music to learning links emotion to thinking and creates strong neural pathways in the brain that aid in long-term retention of knowledge and skills. Chanting and rapping has many of the same benefits of music. It establishes rhythmic patterns that can serve as memory prompts, make learning easier, improve motivation and provide students with a sense of community with the rest of the class. In addition, chanting/rapping and the accompanying motion appeals to visual, auditory and kinesthetic learners. And it is fun. When you're enjoying learning, it is not a chore, it is a pleasure. Learning rap songs accompanied by motion can teach key facts about plants and their needs.

Activity One:

1. Complete the lesson *What We Eat – Part 2* prior to this lesson.
2. Using pictures and objects around the classroom, have students identify things that rhyme: see-me, train-rain, toy-boy, blocks-socks, book-look, etc.
3. Now have students explore action words: hop, walk, dance, swing, march, sing, etc.
4. Explain that the class is going to be writing a rap/chant using rhyming words, the garden, foods you eat. After the rap is written, the class will create a dance to match the action of the words.
5. As an example use "Our Garden Needs Rain." First teach the actions and tell the students they have to match your movement and listen very carefully. Have students stand next to their desks or tables and model these motions:
   a. Sun = arms creating a circle over their heads
   b. Silent scream = mouth open, eyes wide, hands on face, NO SOUND
   c. Light raindrop sprinkling = lightly drum fingertips on desks or tables
   d. Raindrop patter = fingertips drum more loudly on desks or tables
   e. Heavy rain = palms lightly hitting tables or desks
   f. Downpour rain like a cloudburst = stomping feet
   g. Rain slowing = palms lightly hitting tables or desks
   h. Slowing further = fingertips drum more loudly on desks or tables
   i. Back to a sprinkle = lightly drum fingertips on desks or tables
   j. Sun peeking out = looking up for the sun
   k. Sun shining = arms creating a circle over their heads
   l. Proud of the garden = arms spread widely upward, smiling faces

   Practice once or twice to make sure students follow directions.
6. Read the rap and model the motions:

Our Garden Needs Rain©

Our garden needs rain,
it's dry outside. (Sun motion with arms encircling heads)
The sun is shining,
our plants are fried! (Silent scream motion)

Please come rain,
we need you so.
The pitter patter,
little drops you know. (Finger drum lightly on desks or tables)

It sprinkles lightly,
let's hear it fall.
The soil is ready,
to have it all. (Fingers drum more loudly)

It's raining steady,
heavier now. (Palms lightly hitting tables or desks)
I hear thunder
Oh gee! Oh wow! (Drop a heavy book or make a crashing sound)

We're in for a downpour,
that's not so good. (Stomping feet)
Our plants can't take it,
They're in the mud.

It is passing over. (Palms lightly hitting tables or desks.)
The rain is flowing. (Fingers drum loudly)
I'm glad we see,
that water is slowing. (Finger drum lightly on desks or tables)

The storm is passing,
the clouds will thin.
I think I see,
sun peeking in. (Cease drumming and take a peek upward)

The sun is shining, (Sun motion with arms encircling heads)
our plants are fine.
I'm proud to say,
this garden is mine! (Stand with arms stretched widely upward as far as they can reach)

Activity Two:

1. Have students brainstorm words about the school garden, how they feel about it, colors, smells, unusual things they see and experience in it, etc. Take a walking trip to the garden to assist the process and obtain ideas. Make a list in a visual place.
2. Place words that may rhyme with the brainstormed words next to the other words on the list (flower/power, carrot/bear it, lettuce/get us, stem/hem/them, yellow/fellow, green/mean).

3. Share the Salad Rap song below with the class.
4. Working with the students, have the class create a rap/chant about the garden with a salad focus.
5. Add the nutrition component for a link to serving size or specific nutrients and foods that are a treat but should be limited. Have them identify those foods as wants not needs.
   Example:

Salad Rap©

Look in our garden and you shall see,
Vegetables growing
- one, two, three.
Lettuce for fiber and greenery,
Tomatoes for flavor
– yum, yum, yummy.
Sweet green peppers for vitamin C,
A half cup serving for you and me.
Add 'em up, add 'em up, yes sir-ee
We'll fill our plates up naturally.
Vegetables help me
that's what I need,
Pass up sweet treats
reach for the berry.

Activity Three:

1. Have students brainstorm the physical actions that they like to make the most (running, jumping, hopping on one foot, etc.) Include hand, arm, leg, feet and body motions. Make a list of those words.
2. Share the motions that accompany the Salad Rap in the song below.
3. Have students draw the actions using the *Salad Rap Student Handout*.
4. Now add motion or dance moves to the rap/chant students created in Activity Two.

Extensions and Variations:

1. Share with students that songs, chants, raps, and rhymes can help memory. As they learn in school this technique may help them remember complicated information if they have to memorize anything.
   a. One of the concepts that is important when learning about plants is that plants make their own food – they don't eat the way people or animals do. But because people give their plants and gardens fertilizer they call it plant food. It is a bit confusing. So, to make sure they are not confused, the class is going to learn this chant: Plants Don't Eat! The chant can be found in Salad Rap Part 1 on page 64.
   b. Tell students to repeat what you say and chant your part rhythmically.
   c. Repeat whenever you are going to work with plants or in the school garden to ensure that students remember it. This will be an issue that will be measured to meet science standards in a later grade.

Salad Rap©

Look in our garden and you shall see,	(Bend over at the waist and move side to side as if looking at the garden)
Vegetables growing - one, two, three.	(Stand and hop three times)
Lettuce for fiber and greenery,	(Hold the right hand up in front of your face palm outward and swirl it clockwise and down until the palm is facing upward.)
Tomatoes for flavor – yum, yum, yummy.	(Cup the hand to resemble holding a tomato and then rub your stomach in a wide circle)
Sweet green peppers for vitamin C,	(Make a large C with arms)
A half cup serving for you and me.	(Hold the right index finger upright and cross it at the knuckle with the left index finger,)
Add 'em up, add 'em up, yes sir-ee	(Tap crossed fingers three times in another person's direction and three times for yourself)
We'll fill our plates up naturally.	(Hold hands out like a plate and run in a circle to the right.)
Vegetables help me that's what I need,	(Stop and hold up both arms to 'make a muscle.')
Pass up sweet treats reach for the berry.	(Turn away and wave your arms no. Reach out both hands and nod your head.)

2. Have the students make puppets to use in a puppet show in place of physical actions by themselves. The puppets can either represent themselves or the foods in the salad.
3. Have older students also working in the garden (middle school and/or high school students) assist the younger students to create chants/raps and dances in small groups.

Evaluation Options:

1. Assess student participation in brainstorming and contribution for suitable words and in creating the rap/chant and accompanying dance.
2. Have students practice the rap/chant they created until they can perform it well. Perform the rap/chant and dance for another class or parent group or record it. Assess student performance for speech, rhythm, and dance motion accuracy.
3. Have students draw copies of their favorite vegetables, label each with the amount in a serving size and place on *MyPlate*.

Resources:

Raps for Kids, My Word Wizard at www.mywordwizard.com/raps-for-kids.html

Cheers, Chants, Raps, and Poetry, Songs for Teaching, www.songsforteaching.com/chantsraps.htm

Rhyming Worksheets at www.education.com/worksheets/rhyming

Salad Rap

Sample Pre-Post Assessment

1. Name a food grown in your school garden that helps meet your needs.

2. How much of that food is one serving?

3. Name a food not grown in the garden that you want to eat as a treat.

4. What is the difference between a want and a need?

5. Who makes food from air, water and sunlight – plants or people?

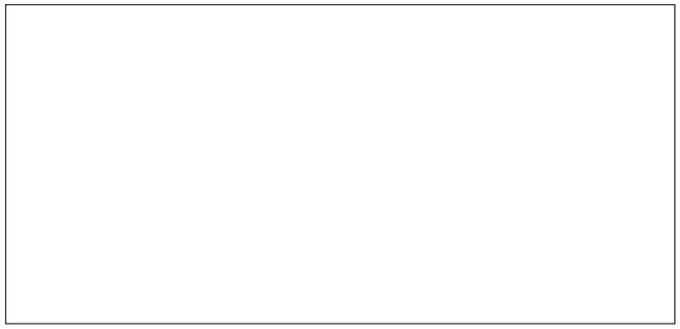
Salad Rap©

Student Handout

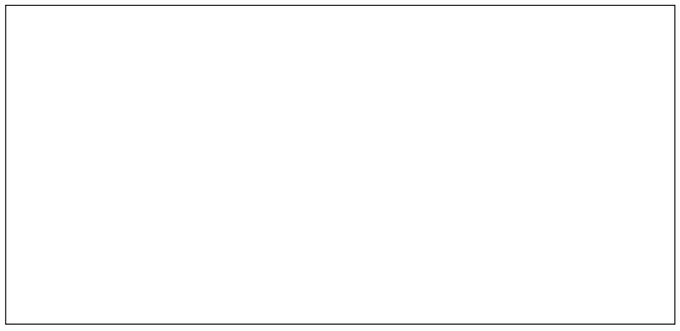
Name: _____

Draw your action:

Look in our garden
and you shall see,

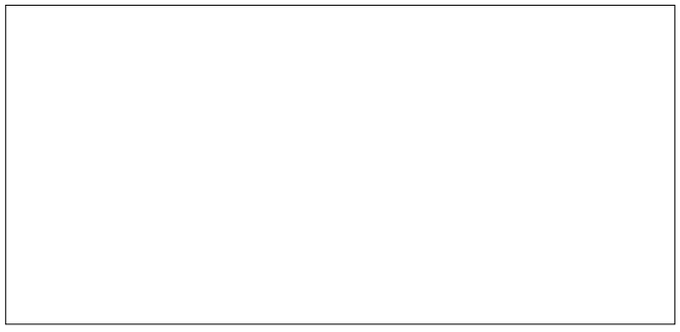


Vegetables growing –
one, two, three.



Lettuce for fiber and greenery,
Tomatoes for flavor – yum, yum, yummy.

Sweet green peppers mixed in for vitamin C,
A half cup serving handed out for you and me.



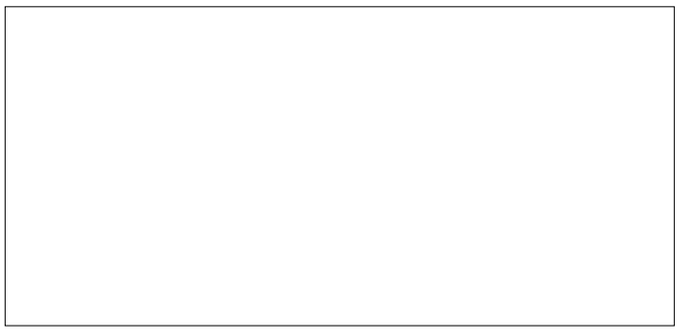
Salad Rap©

Continued

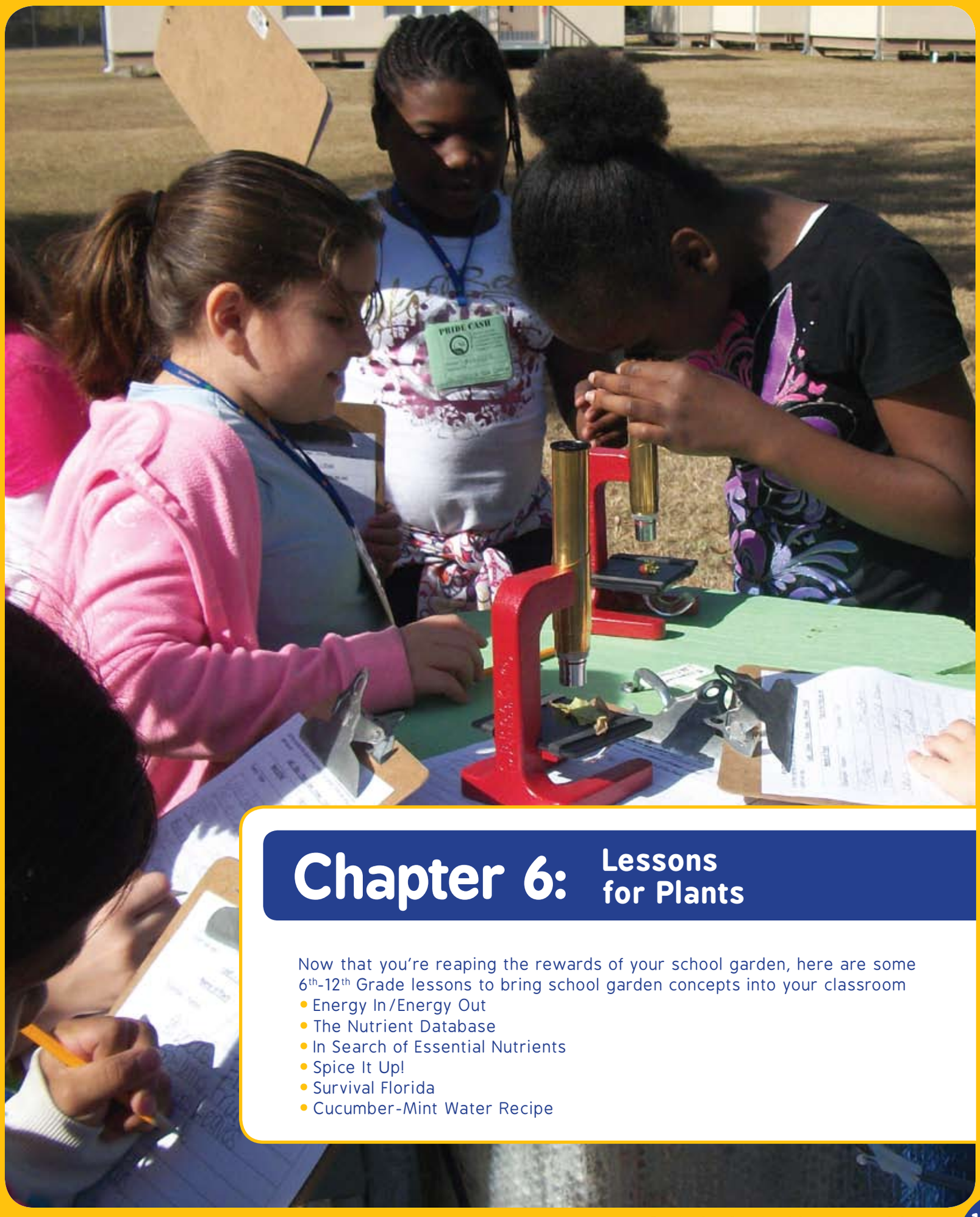
Draw your action:

Add 'em up, add 'em up, yes sir-ee
We'll fill our plates up naturally.

Vegetables help me
that's what I need,



Pass up sweet treats
reach for the berry.



Chapter 6: Lessons for Plants

Now that you're reaping the rewards of your school garden, here are some 6th-12th Grade lessons to bring school garden concepts into your classroom

- Energy In/Energy Out
- The Nutrient Database
- In Search of Essential Nutrients
- Spice It Up!
- Survival Florida
- Cucumber-Mint Water Recipe

Energy In/Energy Out

Subjects Taught: Health, Physical Education, Language Arts, Science, Mathematics

Grade Levels: 6th-12th Grade

Brief Description: Students will evaluate their meal selections, determine the caloric content and evaluate eating and exercise options to maintain a healthy weight.

Objectives: Students will:

1. Track their food consumption over a period of time.
2. Research caloric content of foods eaten.
3. Identify and conduct physical activities necessary to meet the recommended balance of calories and exercise.
4. Research information on nutritional recommendations and exercise habits to build a comprehensive understanding of maintaining a healthy lifestyle.
5. Journal about food intake and exercise and how it influences a healthy lifestyle.

Life Skills: Analyzing, applying, assessing, communicating, comparing and contrasting, constructing, designing, evaluating, interpreting, researching

Materials Needed:

- Research capabilities (library, classroom laptops)

Time:

Four to five, 50-minute class periods, plus time to document food consumption over a period of days as an assignment.

Preparation:

1. Schedule research time with the school library or have access to a classroom set of computers.
2. Arrange a cooperative project with the physical education teacher and language arts, health or science teachers to conduct this lesson.

Vocabulary:

calorie, diet, nutrients, RDA (Recommended Daily Allowance)

Background Information:

It has been widely reported that a significant portion of the American adult population is overweight and an increasing proportion of the overweight are morbidly obese. According to the Centers for Disease Control (CDC), 33 percent of adults over the age of 20 are overweight and another 36 percent of the population over 20 is obese. This is also a significant concern for a large percentage of children and teens also overweight. Again, the latest figures from the CDC indicate that 12 percent of 2-5 year olds, 18 percent of children ages 6-11 and another 18 percent of juveniles ages 12-19 are obese.

These numbers have risen dramatically in recent decades. Many factors contribute to this issue but the problem stems from a basic increase in the overall intake of high calorie foods and decreased physical activity. Contributing to this increased food intake is super-size portions. Please see a comparison in the chart on page 163 of restaurant portion sizes today compared to 60 years ago.

Florida Standards Met At-A-Glance

National Next Generation Science	MS-PS3-f., MS-LS2-F, MS-LS1-k., HS-LS1-a., HS-LS2-e.
English/Language Arts	6.W.3.7, 6.W.3.9, 6.L.3.6, 6.RST.2.4, 7.W.3.7, 7.W.3.9, 7.L.3.6, 7.RST.2.4, 8.W.3.7, 8.W.3.9, 8.L.3.6, 8.RST.2.4, 68.WHST.3.7, 68.WHST.3.9, 910.W.3.9, 910.W.3.7, L.9-10.6., RST.9-10.4., WHST.9-10.7., WHST.9-10.9., W.11-12.7., W.11-12.9., L.11-12.6., RST.11-12.4. WHST.11-12.7., WHST.11-12.9.
Mathematics	6.NS.1.1, 6.NS.2.3, 6.EE.1.1, 6.EE.1.2.B, 6.EE.2.5, 7.NS.1.1, 7.NS.1.2, 7.NS.1.2.C
Physical Education	PE.6.C.1.1, PE.6.L.2.3, PE.6.R.2.2, PE.912.C.1.13
Health	HE.6.B.1.1, HE.6.B.1.2, HE.6.B.1.3, HE.6.B.1.5, HE.6.B.1.6, HE.7.B.1.1, HE.7.B.1.2, HE.7.B.1.3, HE.7.B.1.5, HE.7.B.1.6, HE.8.B.1.1, HE.8.B.1.2, HE.8.B.1.3, HE.8.B.1.6, HE.8.B.3.4, HE.8.B.4.1, HE.8.P.1.3, HE.912.B.1.1, HE.912.B.1.2, HE.912.B.1.3, HE.912.B.3.6, HE.912.P.1.2
Science	SC.6.L.14.3, SC.7.L.17.1, SC.8.L.18.1, SC.912.L.18.7

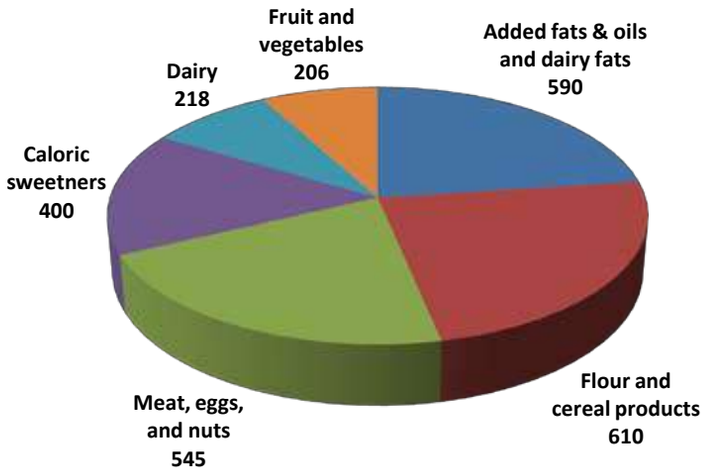
Fast Food Restaurant Serving	1950s	Today
Hamburger	1.6 ounces	4 to 8 ounces
French Fries	2.4 ounces	7.1 ounces
Fountain Drink	7 fluid ounces	42 fluid ounces

As a result, diabetes has risen significantly and for the first time children are being diagnosed with Type 2 diabetes (previously adult-onset diabetes) and high cholesterol. At the same time, consumption of fruits and vegetables is very low. Fewer than 10 percent of adolescents consume the minimum recommended three vegetable servings and two fruit servings per day. Adults are only slightly better at 14 percent. *MyPlate* recommendations indicate that half of every meal plate should be fruits and vegetables with an emphasis on vegetables.

Students need to be made aware of these trends and taught that the way to have a healthy diet is to make healthy food choices. Familiarize yourself with the USDA recommended daily allowance for nutrition, and the USDA *MyPlate* to better explain the recommendations to students at www.myplate.gov.

Flour and cereal products provided more calories per day for the average American than any other food group in 2010

Fruit and vegetables and dairy products provided smaller shares of calories per day for the average American



Notes: Added fats and oils and added sugars and sweeteners are added to food during processing or preparation. They do not include naturally occurring fats and sugars in food (e.g., fats in meat or sugars in fruits).

' Food availability data serve as proxies for food consumption.

Source: Calculated by ERS/USDA based on data from various. sources (see Loss-Adjusted Food Availability Documentation). Data as of February 2014.

Activity One:

1. Have students track their food consumption over a period of time (three days) making a list of the foods they eat, the quantities in which they eat these foods, the major ingredients used, preparation methods used (fried, broiled, baked, roasted, steamed, barbequed, raw, pre-processed, pre-packaged, ready-to-eat) and condiments, sauces or dressings added. Breakfast, lunch, dinner, snacks and beverages should be included.
2. Students also should track the type of exercise they do and the length of time they spend doing it during the three-day period. Exercise should be identified as to whether it's high intensity (running, playing tennis, swimming, riding a bike) or moderate intensity (hiking, playing golf while walking the golf course, gardening, playing volleyball or baseball).
3. Using the meals they have identified, students will break down their meals by food group.
   a. Explain that most foods will be combination foods rather than a single food group. A good worksheet that helps identify proportion of foods to categorize is at www.nourishinteractive.com. If Internet access is not available, they can estimate the proportion of foods that should be in each food group and the number of servings.
   b. Ask them to compare these foods to the food groups they have been advised to consume. What is the result? (Answers will vary.)
4. Have students research the caloric content of their meals, and their calorie needs as determined by the U.S. Department of Health and U.S. Department of Agriculture. Two good sites for information are: www.ndb.nal.usda.gov and www.fnic.nal.usda.gov. Students should ensure that their age and the activity level (that they instinctively feel is theirs) be used for this calculation. Their actual activity level will be revealed later, or use the information they will gather completing the "Nutrient Database" lesson on page 167.
5. Students will then research the calories burned through various forms of exercise. They will compile a list of exercises that they typically participate in and determine the total caloric value of these exercises. Any number of credible sources are available for this information.
6. Have students select two days - one day during which they eat the foods and servings that most closely meet the recommended levels, and a second day that is far from those healthy recommendations. Have students journal about how they felt physically and emotionally on both days.
7. Share background from the Centers for Disease Control with students and explain that maintaining an ideal

weight means balancing the energy consumed with the energy used. Explain these components and that energy consumed is either used to perform bodily functions or it is stored (energy in versus energy out):

a. Energy is used while you are young for the growth of every part of your body (skin, bones, blood, nerves, organs, among others) as you are growing. Adolescence is the fastest growing period in a child's life next to the early toddler years.

b. Energy is needed for bodily functions (breathing, hormone production, digestion, thinking, circulation, temperature control, among others).

c. Energy is needed for exercise (walking, running, swimming, playing sports, among others).

d. Energy is also needed for reproduction, gestation (pregnancy) and lactation (breast feeding). As many as 300 extra calories per day may be needed during the last trimester of pregnancy and 500 calories per day for breast feeding.

e. Energy is commonly measured in calories but the correct terminology is Kilocalories. 1,000 calories = 1 kilocalorie. A kilocalorie is the amount of energy it takes to heat 1 gram of water 1° C (4,184 J).

f. While we think of calories in terms of food, any source of energy can be measured in the same way.

g. Share with students that a 16-ounce can of soda contains 200 kilocalories. How many kilocalories would be in a gallon of soda? (8 ounces = 1 cup, there are 2 cups in a pint, 2 pints in a quart and 4 quarts in a gallon, so there are 16 cups in a gallon. 16 cups x 200 kilocalories = 3,200 kilocalories in a gallon of soda. This amount equals more kilocalories than a middle school or high school student would need in two days.) It is actually the sugar in the soda that provides the energy. Most of soda is water.

h. Compare that with a gallon of gasoline that contains 31,000 kilocalories.

i. All of this energy originates with the sun and the photosynthesis of plants. All other energy sources on the planet are from that transfer of energy from one organism to another or into one form or another. During that transfer, energy is lost to the environment in the form of heat or sometimes light (light bulbs, fire, explosions, internal combustion engines).

8. Explain that in human nutrition if the energy consumed equals the energy needs for the body – no matter what level those needs are – the weight will remain stable. If the energy consumed is less, weight loss will occur. If the energy consumed is more, weight gain will occur. The focus here is not on appearance but health. Discuss that one size does not fit all. People come in different shapes, sizes, body types, and metabolic rates. The focus should be on an individual meeting their own health needs not fitting into a idealized shape, size or weight. (Attempting to do so can lead to eating disorders.)

9. Provide students with this generalized information:

Estimated Calorie Needs — Males

Age	Sedentary	Moderately Active	Active
11	1800	2000	2200
12	1800	2200	2400
13	2000	2200	2600
14	2000	2400	2800

Estimated Calorie Needs — Females

Age	Sedentary	Moderately Active	Active
11	1600	1800	2000
12	1600	2000	2200
13	1600	2000	2200
14	1800	2000	2400

Institute of Medicine Dietary Intakes Micronutrients Report. 2002. (Actually Kilocalories)

10. After determining their recommended caloric and nutrient intake per day for a period of days, students will then determine the discrepancy between what he or she consumes (based on their meals they typically consume from their food journal created in activity 1), activity level and energy consumed for those activities, and what is required. Research activities or exercises needed to burn off these calories and the time required to do so.

11. Ask students to journal to answer these questions:

"If what is consumed exceeds the calories recommended, what options are there to maintain a healthy weight? How much exercise would be needed to accommodate for the additional caloric intake? What options are there to reduce the calories consumed? Can nutrient-rich fruits and vegetables be exchanged for high calorie but nutrient-sparse snack foods?"

"If the amount of caloric intake does not meet the recommended amount, what options are there to maintain a healthy weight? What healthy fruits and vegetables could be consumed as snacks to bring them up to a level of maintenance? If you plan to undertake energetic

sports or are growing rapidly, what steps do you need to take to meet your caloric needs?"
"What are your internal hunger cues? Thirst cues? Can the two be confused? Can they be confused with boredom, anxiety or emotional needs?"
"What are your internal cues that indicate you are full and that you should stop eating? Can they be confused with boredom, anxiety or other emotional feelings?"

Activity Two:

1. In cooperation with the physical education teacher, have the class participate in sample exercises using the U.S. Department of Health and U.S. Department of Agriculture recommendations and record the number of calories burned.
2. Have each student report to the class or write in their journal their accomplishments, the type of exercise completed, the length of time it took to burn off the calories and their feelings about how much effort it took to equal the amount of calories eaten.
3. Based on the student's meal plan selected, the caloric and nutrient requirements, and exercise needs, students will create a chart that clearly details their findings. They should include in their submissions the sources of their information.

Activity Three:

1. Depending on the outcome of these activities, discuss students' perceptions of the options they have to maintain a healthy weight.
2. Have students determine what their optimal (healthy) weight is. Current thought is that it should be a range focused on Body Mass Index (BMI) but there is much discussion on this topic and new options are in the development stages.
3. Ask each student to design a meal and exercise plan to reach that weight. Remind them that they are still growing and changing and that the focus should be on health.
   a. Have each student create a step-by-step approach to make changes slowly over time. Make sure that their plans include eating recommended serving sizes, selecting items from each food group and participating in recommended physical activity. Research indicates that a slow, methodical approach is more successful than a sudden, radical change.
   b. Ask each student to indicate the ways they will plan to incorporate more fruits and vegetables in their diet.
   c. Utilize the school garden to encourage fruit and vegetable consumption.
   d. Have students refer back to their consumption chart and make sure their plans include all food groups.

Evaluation Options:

1. Students will submit their charts containing their meal options, calorie counts, nutritional requirements and accommodations for variances in the consumed and required ratio to be evaluated, and math calculation to be checked for accuracy.
2. Have students write about the days they felt healthy, alert, physically sound and had a sense of well being and identify the factors that lead to that experience. Then have them write about the days they felt the opposite – unhealthy, sluggish, tired, and physically unsound - and identify the factors that led to those feelings.
3. Have students develop a plan to eat better and exercise more. Assess students' completion of their future plans and credibility of process they plan to undertake.

Extensions and Variations:

1. People say the high cost of fruits and vegetables limits their ability to consume these items. How real is this limitation? Students will research and evaluate the actual

costs associated with buying whole fruits and vegetables by following the instructions below.

a. Provide the following scavenger hunt questions.
   Scavenger Hunt Questions:
   1. Find a fresh vegetable that costs more than 90 cents a pound.
   2. Determine the difference in price between two different foods that grow underground.
   3. Locate a red fruit that grows above the ground on a bush and costs more than 99 cents a pound but less than $2.99 a pound.
   4. Identify a food that grows on a tree that costs less than 50 cents a pound.
   5. Locate a food that contains wheat or oats. Calculate the cost per pound.
   6. Find green produce that might be used in a salad that has a 9 in the hundredth's place.
   7. Determine the total cost of 3.5 pounds of a vegetable that is any color other than green.
   8. Calculate the price of two pounds of a red, orange or green food that grows on a vine.
   9. Write out all the ingredients you have selected for your meals and the price per pound of each fresh food item.
   10. If you were to buy four pounds of every item that can be found in the produce section, how much would you spend?

b. Have students answer the questions using the resources listed in the Resource Section at the end of this lesson as well as grocery store ads.

2. Have students use the "Fruit and Vegetable Calculator" at the Centers for Disease Control website (CDC) at www.cdc.gov/nutrition/everyone/fruitsvegetables/howmany.html and compare their actual daily food intake and create a plan to meet their recommended dietary levels.

3. Have students research and create a visual depiction of one of these topics:
   a. Your state's consumption of fruits and vegetables using State Indicator Report on Consumption of "Fruits and Vegetables," Centers for Disease Control www.cdc.gov/nutrition/downloads/stateindicatorreport2009.pdf
   b. "Portion Distortion" at the National Heart, Lung and Blood Institute www.nhlbi.nih.gov/health/public/heart/obesity/wecan/eat-right/distortion.htm
   c. The change in obesity over time and the health implications. They can begin with the information at the Centers for Disease Control at http://www.cdc.gov/nchs/fastats/obesity-overweight.htm
   d. Compare the energy in food to the energy it takes to operate other energy dependent appliances and machines. (For example: The energy in a slice of cherry cheesecake could power a 60 watt light bulb for an hour and-a-half.)
4. Use any of the resources available at Choose *MyPlate* at www.choosemyplate.gov.
5. Have students research and write about eating disorders.

Resources:

US Department of Agriculture at
www.usda.gov

National Institutes of Health
www.nih.gov

ChooseMyPlate
www.choosemyplate.gov

USDA Nutrient Database, United States Department of Agriculture
www.ndb.nal.usda.gov

Nutrient Data Laboratory, U. S. Department of Agriculture
www.ars.usda.gov

The Nutrient Database

Subjects Taught: Nutrition, Language Arts, Physical Education, Science

Grade Levels: 6th-12th Grade

Brief Description: USDA's "Nutrient Database" will be the focus of research to identify which foods contain necessary nutrients and which foods grown in the garden are most nutrient dense or will meet specific nutritional needs.

Objectives: Students will:

1. Research the nutritional needs for their own age, height and weight.
2. Use the USDA "Nutrient Database" to research nutritional composition for three fruits and/or vegetables.
3. Select produce from the school garden that they believe contains the most nutrients.
4. Create a ranking system to compare produce.
5. Compare selected produce from the school garden.
6. Identify produce that will help meet the nutritional needs most often lacking in their age group.
7. Create a week of menus using produce from the school garden to meet their nutritional needs and a method to promote eating those foods.

Life Skills: Analyzing, comparing, evaluating, researching

Materials Needed:

- Three copies of this lesson's *Nutrients from the Garden Student Handout* per student
- Computers with Internet access

Time:

Introduction: 20 minutes plus time to define vocabulary
Activity One: 45 minutes to one hour
Activity Two: 45 minutes to one hour
Activity Three: 45 minutes to one hour

Preparation:

1. Ensure access to computers for students to conduct Internet research.
2. Make copies of student handout: *Nutrients from the Garden* — three per student.

Vocabulary: Carbohydrates, cholesterol, database, lipids, minerals, monounsaturated fatty acids, nutrients, polyunsaturated fatty acids, protein, saturated fatty acids, vitamins

Background Information:

The U.S. Department of Agriculture (USDA), its research arm the National Institute for Agriculture (NIFA) and the researchers at land grant universities across the country have been conducting research on food and agriculture since the end of the Civil War. One of the areas researched is the nutritional composition of foods. Compilation of that data can be found in one centralized location in USDA's "Nutrient Database" available at www.ndb.nal.usda.gov. The database is kept up to date. If errors are found, corrections will also be found at the Nutrient Data Laboratory home page at www.ars.usda.gov. The database is searchable, contains both raw foods and processed foods, continues to expand as foods are created or altered and even has foods from specific restaurant chains. Foods are given in portion sizes but vary

Florida Standards Met At-A-Glance

National Next Generation Science	MS-ESS3-c., HS-ESS3-b.
English/Language Arts	6.W.3.7, 6.W.3.9, 7.W.3.7, 7.W.3.9, 8.W.3.7, 8.W.3.9, 910.W.3.7, 910.W.3.9, 1112.W.3.7,1112.W.3.9, 6.L.3.6, 7.L.3.6, 8.L.3.6, 910.L.3.6, 1112.L.3.6, 68.RST.2.4, 910.RST.2.4, 1112.RST.2.4, 68.WHST.2.4, 910.WHST.2.4, 68.WHST.3.7, 910.WHST.3.7, 1112.WHST.3.7, 68.WHST.3.9, 910.WHST.3.9,1112.WHST.3.9
Social Studies	SS.8.G.5.1
Physical Education	PE.6.C.1.8, PE.912.C.1.13
Health	HE.6.B.1.7, HE.6.B.3.1, HE.6.B.3.5, HE.6.B.3.6, HE.6.B.3.7, HE.6.B.4.2, HE.6.B.4.3, HE.6.C.2.6, HE.7.B.1.7, HE.7.B.3.1, HE.7.B.3.5, HE.7.B.4.2, HE.7.C.2.6, HE.912.P.2.1
Science	SC.6.L.14.3

between grams, cups, whole vegetables, other raw forms and restaurant servings. Some standardization calculations may be needed if comparisons are desired and students should be alerted to that fact.

Introduction:

1. Using the "Dietary Reference Intakes" for dietary planning at the Food and Nutrition Information Center of the USDA at www.fnic.nal.usda.gov/fnic/interactiveDRI/dri_results.php have students calculate their nutritional requirements for all categories possible and print off the information for their own personal use or copy and paste the information into their own document to save for future reference. This will be used for several lessons.
2. Review serving sizes for various foods at the Food and Nutrition Service of the USDA at www.fns.usda.gov or in the appendices of Project Food, Land & People's *Resources for Learning*.
3. Have students define the vocabulary words.

Activity One:

1. Explain to students that all foods have varying nutritional values. We are constantly being told to eat more fruits and vegetables but not being told why that is so important.
2. Using one cup of chopped raw carrots as an example, have students use the USDA's "Nutrient Database" available at www.ndb.nal.usda.gov to complete the *Nutrients from the Garden Student Handout* in this lesson. This first exercise is to ensure that all students are able to properly use the database and then have that information to create standards for the other activity.
3. Ask each member of the class to select two fruits or vegetables from the school garden that they believe contain the most Vitamins A, C and E and the most minerals – magnesium, phosphorus, and potassium. Make sure they write down their choices.

Activity Two:

1. Explain that the class will now create a rubric to use to give the produce in the garden a score for comparison of its nutritional value.
   a. Divide the class into small groups of three to five students and assign each group a portion of the *Nutrients from the Garden Student Handout* to use to build a rubric for the whole handout.
   b. Using the Dietary Reference Intakes (DRI) for each component, have the students create a score. (i.e., a food that provides 100 percent of vitamin A requirements in a single serving could receive 100 points, 50 percent receives 50 points, 25 percent receives 25 points). See reference box below to calculate the percentage of a fruit or vegetable nutrient listed in the *Nutrients from the Garden Student Handout*.
   c. Make sure that the rubric reflects the correct units for each nutrient. It does not matter if each group creates a different scoring system as long as the nutrients for each fruit or vegetable are scored using the same rubric. However, points may be both positive and negative. (i.e. positive points for monounsaturated fats, negative points for LDL cholesterol and saturated fats. Note: Fruits and vegetables generally will not have these in large amounts but students should be thinking about the good and potentially bad elements in any food they consume.)
   d. Combine the group's efforts into a single scoring system for the whole class on a *Nutrients from the Garden* chart. This will provide a score for the overall quality of nutritional value of multiple nutrients.
   e. In addition, have the class create a single number to add to the score for the overall number of nutrients (i.e. one point per positive nutrient and subtract a point for each negative nutrient. They are not to consider the amount, but just the presence of the nutrient).
2. Present the rubric to the class and create a scoring sheet to be used to evaluate the garden produce. Explain that this

To calculate the percentage of a fruit or vegetable nutrient listed in the *Nutrients from the Garden Student Handout*, divide the amount of the nutrient (example: Vitamin C), found in the USDA's Nutrient Database by the amount of the nutrient needed, found in the USDA's Dietary Reference Intake, and multiply it by 100 to get the percentage.

$$\frac{\text{Amount of Fruit or Vegetable Nutrient (Nutrient Database)}}{\text{Amount of Fruit or Vegetable Nutrient Needed (Dietary Reference Intake)}} \times 100 = \%\ \text{received by fruit or veggie}$$

*To create a rubric, the Dietary Reference Intake website requires the teacher to select an average size student to complete the calculation. Because it's difficult to determine an average size student, teachers should use their discretion and perhaps calculate two rubrics - one for a male and one for a female student.

focus is not on foods that are "good" or "bad" for you but on nutrient density of the foods they are (or are not) consuming. The point is to impress students with the fact that fruits and vegetables provide a wealth of essential nutrients and to encourage them to eat more fruits and vegetables.

Activity Three:

1. Pair up students and have them give their partner the two fruits or vegetable choices they wrote down as their selections for the most vitamins A, C and E and the most minerals such as magnesium, phosphorus and potassium. (These have been selected as examples to save classroom time and do not reflect their importance over any other nutrients.) Using the scoring rubric developed by the class, have each pair score their partner's choices.
2. Identify the fruits or vegetables that are the most nutritious according to the scoring system developed by the class and which student selected the top picks.
   a. Discuss which fruits or vegetables (using the examples) are most nutritious and which are least.
   b. Using only the produce in the garden, can the class members meet their daily nutritional needs? Why or why not? What nutrients are missing? What foods could make up those deficiencies?
3. Share with students research in the *Journal of the American Dietetic Association* that shows teens are lacking in important nutrients in their diets. The latest figures are:

For Girls ages 12-19:	For Boys ages 12-19:
85% are deficient in Magnesium	71% are deficient in Magnesium
89% are deficient in Folate (a B vitamin)	74% are deficient in Folate (a B vitamin)
61% are deficient in Vitamin A	51% are deficient in Vitamin A
45% are deficient in Vitamin C	40% are deficient in Vitamin C
89% are deficient in Calcium	69% are deficient in Calcium
60% are deficient in Iron	11% are deficient in Iron

Ask them to identify which foods from the garden would help them meet these needs.

Evaluation Options:

1. Assess student performance in completing the assigned research and cooperation in completing the group work, including accuracy, completeness, discussion, developing rubric and comparing produce.
2. Have students use their nutritional requirements (found in the introduction) and the USDA "Nutrient Database" to create a week-long menu of healthy meals that will meet their nutritional requirements using the produce from the garden.
3. Have students create a vehicle to promote eating fruits and vegetables to their peers with sound explanations that will result in changing behaviors with a focus on promoting fruits and vegetables grown in the school garden.

Extensions or Variations:

1. Have students create graphs comparing nutrients for various foods. Create separate graphs depicting vitamin C, vitamin A, folate, calcium, iron and magnesium, comparing the amount of each nutrient for a variety of produce from the garden on each graph.
2. Have students group vegetables by nutrients (i.e., potatoes, tomatoes, and bell peppers are all high in vitamin C).
3. Have students group fruits and vegetables by color and examine whether colors have nutrients in common. Compare colors by nutrient density.
4. Have students select a nutrient that is commonly deficient in students in their age range (Activity Three #3) and research all of the vegetables that provide this nutrient. Rank the vegetables from highest to lowest.

Resources:

USDA "Nutrient Database," U.S. Department of Agriculture. www.ndb.nal.usda.gov

Nutrient Data Laboratory, U.S. Department of Agriculture. www.ars.usda.gov

Credits:

Bermudez Consultenos International. "Updated Analysis of the 1994-96, 1998, Continuing Survey of Food Intake by Individuals (CSFII)" August 2002.

Cotton PA, et.al. "Dietary Sources of Nutrients Among US Adults," Journal of the American Dietetic Association, 2004 June1, 04 (6):921-30.

USDA "Nutrient Database," U.S. Department of Agriculture. www.ndb.nal.usda.gov

"Nutrient Data Laboratory," United States Department of Agriculture. www.ars.usda.gov

The Nutrient Database

Sample Pre-Post Assessment

1. List one credible source of information on nutrition that is research based.

2. What government agency conducts research on the nutritional composition of foods?

3. List three foods from the school garden and a specific nutrient that each supplies.

4. Give one reason why eating fruits and vegetables is important to your health.

Nutrients from the Garden

STUDENT HANDOUT

Name _____

Select three fruits or vegetables grown in the school garden that you believe contain the highest level of nutrients. Using the U.S. Department of Agriculture's "Nutrient Database" at *www.ndb.nal.usda.gov* complete the information requested below. NOTE: Common use of the terms fruit and vegetable are used and not botanical designations.

Fruit or Vegetable		Serving Size	Carbohydrate		Protein	Fiber	Fat
			Total	Sugar			
Minerals:	**Calcium**	**Iron**	**Magnesium**	**Phosphorus**	**Potassium**	**Sodium**	**Zinc**
Fat-soluble Vitamins:		**A (RAE)**	**A**	**D**	**D 2 &3**	**E**	**K**
Water-soluble Vitamins:		**C**	**Thiamin**	**Riboflavin**	**Niacin**	**B-6**	**Folate**
		B-12					

Lipids	Saturated Fatty Acids	Monounsaturated Fatty Acids	Polyunsaturated Fatty Acids	Cholesterol

Nutrients from the Garden

Name _____*SAMPLE*_____

Select three fruits or vegetables grown in the school garden that you believe contain the highest level of nutrients. Using the U.S. Department of Agriculture's "Nutrient Database" at *www.ndb.nal.usda.gov* complete the information requested below. NOTE: Common use of the terms fruit and vegetable are used and not botanical designations.

Fruit or Vegetable		Serving Size	Carbohydrate		Protein	Fiber	Fat
			Total	Sugar			
Carrot –raw		1 cup chopped	12.26 g	6.07g	1.19 g	3.6 g	0.31g
Minerals:	**Calcium**	**Iron**	**Magnesium**	**Phosphorus**	**Potassium**	**Sodium**	**Zinc**
	42mg	0.38mg	15mg	45mg	410mg	88mg	0.31mg
Fat-soluble Vitamins:		**A (RAE)**	**A**	**D**	**D 2 &3**	**E**	**K**
		1069mcg	21384 IU	0.0 IU	0.0µg	0.84mg	16.9µg
Water-soluble Vitamins:		**C**	**Thiamin**	**Riboflavin**	**Niacin**	**B-6**	**Folate**
		7.6mg	0.084mg	0.074mg	1.258mg	0.177mg	24mcg
		B-12					
		0.0µg					

Lipids	Saturated Fatty Acids	Monounsaturated Fatty Acids	Polyunsaturated Fatty Acids	Cholesterol
	0.047g	0.018g	0.150g	0.0mg

In Search of Essential Nutrients

Subjects Taught: Science, Language Arts

Grade Levels: 5th-12th Grade

Brief Description: Students explore the meaning of essential nutrients, using periodic tables to compare the elements that are essential to people and plants. Students make predictions as to where in the environment plants obtain each of their essential elements.

Objectives: Students will:

1. Define an essential element;
2. Compare and contrast the essential nutrient requirements of plants and humans.
3. Identify the sources for each essential nutrient needed by plants.

Life Skills: Analyzing, communicating, constructing explanating, evaluating, interpreting data, investigating

Materials Needed:

- Colored pencils – one per student
- Projectable images of the following handouts in this lesson:
  - Essential Nutrients
  - The Periodic Table
  - Essential Plant Nutrients
  - Essential Human Nutrients
  - Sources of Essential Nutrients
- One photocopy per student of the following handouts in this lesson:
  - The Periodic Table
  - Chemical Symbols of the Elements
  - Sources of Essential Nutrients

Time:
Three, 45-minute class periods

Preparation:
Have students bring a nutrition label from a box of cereal, like Cheerios®, a nutrition label from a snack food, such as a candy bar, and a nutrition label from a canned or frozen fruit or vegetable.

Florida Standards Met At-A-Glance

National Next Generation Science	5-LS2-d., 5-ESS2-a., MS-PS1-f., MS-LS2-e., MS-LS2-f., MS-LS2-a., MS-ESS3-c., HS-LS2-e., HS-LS2-f., HS-ESS3-a., HS-ESS3-b., HS-ESS3-i.
English/Language Arts	5.RI.1.1, 5.RI.1.3, 6.W.3.9, 7.W.3.9, 8.W.3.9, 910.W.3.9, 1112.W.3.9, 6.WHST.1.2, 6.WHST.2.4, 6.WHST.3.7, 7.WHST.1.2, 7.WHST.2.4, 7.WHST.3.7, 8.WHST.1.2, 8.WHST.2.4, 8.WHST.3.7, 910. WHST.2.4, 1112.WHST.1.2, 1112.WHST.2.4, 6.RST.1.1, 6.RST.3.7, 7.RST.1.1, 7.RST.2.4, 7.RST.3.7, 8.RST.1.1, 8.RST.2.4., 8.RST.3.7, 910.RST.2.4, 1112.RST.2.4.
Social Studies	SS.8.G.5.1
Health	HE.7.C.2.6, HE.912.P.2.1
Science	SC.5.L.17.1, SC.6.L.14.3, SC.7.L.17.1, SC.7.L.17.3, SC.8.L.18.1, SC.8.L.18.3, SC.912.L.14.7, SC.912.L.17.10, SC.912.L.18.10, SC.912.L.18.9

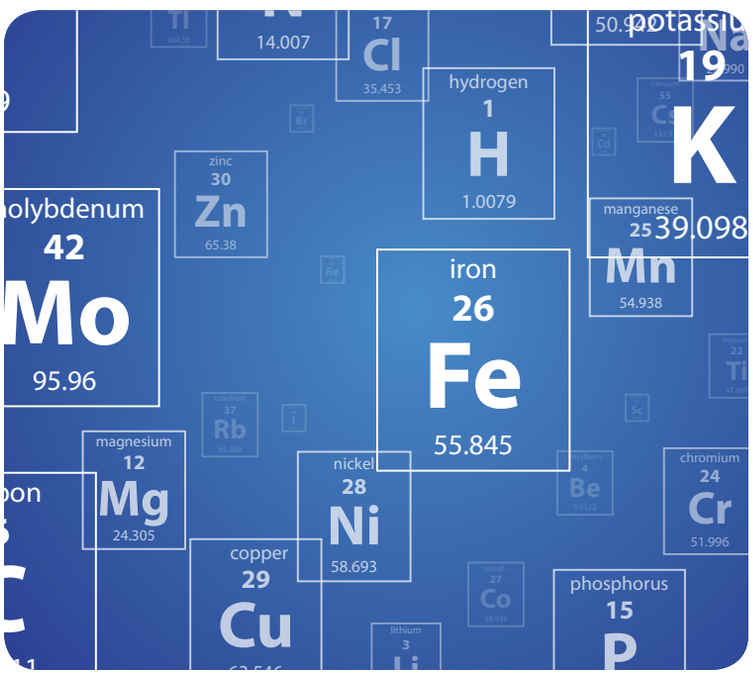
Prepare the five projectable images in this lesson in whatever media is available to you. If an overhead projector is the only audio-visual equipment available, make transparencies. If a computer and LCD projector is available, convert it to Power-Point presentation. If a Smart Board or Prometheus board is available, convert it for use with that technology.

Vocabulary: essential nutrients

Background Information:

There are more than 100 known elements that combine in a multitude of ways to produce compounds, which account for the living and non-living substances we encounter. Out of that list of 100 elements, plants require 17 essential nutrients to complete their life cycles - germinate, grow, build tissue, flower, pollinate, produce seed or vegetative structures to reproduce (runners, tubers, bulbs, rhizomes, etc.) and/or survive cold or dry periods. A nutrient is considered essential if it is required by the plant to complete its life cycle, cannot be replaced by another nutrient, is directly involved in the plant's metabolism, and is required by many different plants. These nutrients are identified in the projectable image called "Essential Plant Nutrients." Plants that grow on land obtain these nutrients from the air, water and soil.

Cells carry on the many functions needed to sustain life. This requires that they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or organism needs. Plants and humans require similar sets of essential nutrients. The essential nutrients needed by humans are identified in the projectable image called "Essential Human Nutrients."



In the context of plant requirements, carbon, oxygen, and hydrogen are called the non-mineral nutrients. Some essential nutrients are obtained from more than one source. For the purpose of this activity, you want students to realize that plants obtain their non-mineral nutrients (carbon, hydrogen, and oxygen) from the air and water, and the rest come from the soil.

Activity One: Essential Nutrients

1. Begin the lesson by explaining that scientists who are interested in studying human health must understand the specific needs of the body. Ask:
   "What do humans need to live?"(*Answers will vary.*)
   Accept all answers.
2. Write student responses on the board, overhead transparency, or using an electronic board.
3. Direct the discussion to elicit air (oxygen), water, and food. Some students may realize that sleep is also required for survival. Other students may suggest environmental conditions such as temperature and pressure, or material things such as clothing and shelter.
4. Remind students that life requires energy for its existence. Ask students:
   "What do people take into their bodies from their environment to help them survive?" (*Students should recognize from their previous answers that air, water, and food are obtained from the environment.*)
   "What do we need from the air?" (*Oxygen from the air is what we require.*)
   "Why do we need water? (*Students should be able to explain that our cells are mostly made of water. Water is the medium from which life has evolved. It is required for the chemistry of life.*)
   "Why do we need food to survive?" (*Students should recognize that we derive chemical energy from food and that food supplies the chemical building blocks needed by our cells.*)
5. Remind students that humans (and animals) eat plants and other animals to obtain chemical energy and provide them with the building blocks needed by their cells. Ask:
   "Do plants need food?" (*No, not in the sense that humans or other animals eat food. Plants do not eat. Plants make food from minerals, water, and gases. Plants do need nutrients. What may be commonly be called "plant food" is actually fertilizer.)* Make sure students realize that **Plants Do Not Eat!** Plants absorb nutrients from soil as they take in water. Plants absorb carbon dioxide through their leaves from the atmosphere during photosynthesis.
6. Explain that they will now investigate the chemical elements that are essential for plant growth.
   a. Display the image of "Essential Nutrients."

b. Ask different students to read aloud the criteria that describe an essential element.

7. Hand out a copy of "The Periodic Table" and a copy of "Chemical Symbols of the Elements" to each student.
8. Instruct the class to think about the definition of "essential element" and use a colored pencil to shade those elements on the periodic table that they think are essential for healthy plant growth based on the information they have learned in the past.
   a. If possible, students should provide an example of how a given element is used by the plant (such as nitrogen being used to make protein).
   b. Give students about five minutes to complete this task. This step gives you an opportunity to assess how well students can relate their knowledge of chemistry to biology. For example, students may respond that carbon is used to make sugar. Students will probably not suggest a function for elements needed in trace amounts. Usually such elements are needed as cofactors for enzymes. It is not important to discuss the uses of each element, but it is important that students understand that these elements are needed to build cell structures and to carry out the cell's chemistry through enzymatic reactions.
9. Project the image of "The Periodic Table."
   a. Ask a student volunteer to read aloud the elements shaded on his or her periodic table.
   b. Have the student explain why he or she selected those particular elements.
   c. Have additional students add to the list with their predictions.
   d. As the elements are read off, circle them on "The Periodic Table."
   e. Students are not expected to identify the complete list of essential elements. Their responses, however, will reflect their relative knowledge about the biology of plants.
10. Explain that you are now going to reveal which elements have been shown to be essential for plant growth and compare them with students' predictions. Display the image of "Essential Plant Nutrients."
    a. Students likely will be surprised that so many elements are essential for plant growth.
    b. The comparison between the elements predicted by the students and the accepted ones should result in some overlap, especially among the most abundant elements: carbon (C), hydrogen (H), nitrogen (N), oxygen (O), phosphorus (P), and sulfur (S).
    c. If not already mentioned, ask students to name an important molecule in the cell that requires the element phosphorus. You can explain that the most important energy molecule in the cell is adenosine triphosphate (ATP) and it includes the element phosphorus.
11. Ask:
    "Do you think that humans require the same essential elements as plants?" (*Responses will vary. Some students may think that since humans and plants are very different from each other, they will need different sets of elements. Others may reason that since plants and humans are each made of cells, the essential elements needed by both will be similar. Still others may think that since all of the food humans consume ultimately begins with plants that the nutrients may be similar or exactly the same.*)
12. Display the image of "Essential Human Nutrients."
    a. Ask students to comment on how similar or dissimilar the pattern of elements is compared with that shown previously for plants.
    b. Students should notice that the two patterns are more alike than different. If using transparencies, you can align and overlap the transparencies of "Essential Plant Nutrients" and "Essential Human Nutrients" to make this point clearer. If using other technology, circle the similarities.
13. Referring to the box of cereal, candy bar and fruit or vegetable nutrition labels, ask students what types of nutrients they think humans need and how different foods can provide those nutrients. Have the students look at the three labels to see how they compare. Ask:
    "Which nutrients from both labels are the same?"
    a. Have students share with another student nearby the ingredients listed on the labels.
    b. Have students refer back to The Periodic Table of elements. Which of the nutrients from the nutrition label can students find on the periodic table?
    c. Which of the nutrients on the labels are also nutrients that plants need?
    d. Ask students to compare some of the common nutrients that plants and humans both need, such as calcium, copper, iron, magnesium, phosphorus, potassium and zinc.
    e. Based on the cereal nutrition label, have five students share which of their foods seem to provide the most nutrients for humans and create a list.
14. Summarize the concept that nutrients plants require to grow are similar to the ones humans need to grow. Humans receive these nutrients from plants.

Activity Two: Sources of Essential Nutrients

1. Explain that you will conclude the lesson with a brief activity that explores where plants obtain their essential nutrients.

2. Pass out to each student a copy of the handout "Sources of Essential Nutrients."
3. Explain that the handout lists the 17 essential plant nutrients. Instruct students to think about where a plant obtains its essential nutrients.
   a. Students should indicate the source—air, water, and soil—of each nutrient (that is each chemical element) by checking the appropriate boxes on the handout.
   b. For the purpose of this activity, students should think about water as rainfall (before it reaches the ground). It therefore should not include those elements found in soil that may be dissolved in it.
   c. Students are free to check more than one box for any element.
   d. Give students about five minutes to complete this task.
4. Review the following information with students:
   - The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor.
   - Water, which covers the majority of the earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle."
   - Soil consists of weathered rocks and decomposed organic material from dead plants, animals and bacteria.
5. Display a transparency of "Sources of Essential Nutrients."
   a. Ask a student volunteer to describe which elements he or she listed as coming from water.
   b. Put a "W" next to the elements named by the students. Of course, students probably will mention hydrogen and oxygen. Actually, rainwater may contain small amounts of other elements derived from atmospheric gases and dust particles.
6. Ask another student volunteer to describe which elements he or she listed as coming from the soil.
   a. Put an "S" next to the elements named by the students.
   b. Students should list most if not all of the essential elements.
   c. Share that the soil not only contains many elements that reflect its geological history, but it also contains organic material from once-living plants and animals as well as from the abundant microbial life that resides there.
7. Ask another student volunteer to describe which elements he or she listed as coming from the air.
   a. Put an "A" next to the elements named by the students.
   b. Students should recognize that plants obtain carbon (via CO_2) and oxygen (via O_2) from the air. (Plants take in carbon dioxide and release oxygen while the sun shines and they are undergoing photosynthesis. But at night, the plant respires just like other organisms and takes in oxygen and gives off carbon dioxide.)
   c. Some students may know that most of the atmosphere is nitrogen (N_2).
   d. As with water, small amounts of other elements also may be present due to air pollution.

Evaluation Options:

1. Assess student completion and accuracy of "Sources of Essential Nutrients."
2. Evaluate student participation in discussion and activities.
3. Have students select one of the nutrients discussed that is essential to both humans and plants. Ask them to research the nutrient and write how it is used in plants and in humans, what symptoms occur if there is a deficiency of this nutrient and sources of this nutrient for both plants and humans.
4. Have students research and diagram the nitrogen, carbon and water cycles.

Lesson adapted with permission from Nutrients for Life Foundation's "Nourishing the Planet in the 21st Century" Lesson 1

In Search of Essential Nutrients

Sample Pre-Post Assessment

1. What is an essential element?

2. Do plants and animals have the same essential elements? If so name three.

3. How do plants obtain essential elements?

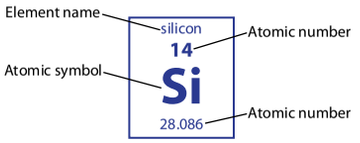
Adapted with permission from Nutrients for Life Foundation's "Nourishing the Planet in the 21st Century" Lesson 1.

Essential Nutrients

An essential element

1. is required for a plant to complete its life cycle
2. cannot be replaced by another element
3. is directly involved in the plant's metabolism
4. is required by many different plants

Periodic Table of Elements



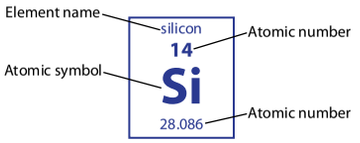
hydrogen 1 **H** 1.0079																	helium 2 **He** 4.0026
lithium 3 **Li** 6.941	beryllium 4 **Be** 9.0122											boron 5 **B** 10.811	carbon 6 **C** 12.011	nitrogen 7 **N** 14.007	oxygen 8 **O** 15.999	fluorine 9 **F** 18.998	neon 10 **Ne** 20.180
sodium 11 **Na** 22.990	magnesium 12 **Mg** 24.305											aluminium 13 **Al** 26.982	silicon 14 **Si** 28.086	phosphorus 15 **P** 30.974	sulfur 16 **S** 32.065	chlorine 17 **Cl** 35.453	argon 18 **Ar** 39.948
potassium 19 **K** 39.098	calcium 20 **Ca** 40.078	scandium 21 **Sc** 44.956	titanium 22 **Ti** 47.867	vanadium 23 **V** 50.942	chromium 24 **Cr** 51.996	manganese 25 **Mn** 54.938	iron 26 **Fe** 55.845	cobalt 27 **Co** 58.933	nickel 28 **Ni** 58.693	copper 29 **Cu** 63.546	zinc 30 **Zn** 65.38	gallium 31 **Ga** 69.723	germanium 32 **Ge** 72.64	arsenic 33 **As** 74.922	selenium 34 **Se** 78.96	bromine 35 **Br** 79.904	krypton 36 **Kr** 83.798
rubidium 37 **Rb** 85.468	strontium 38 **Sr** 87.62	yttrium 39 **Y** 88.906	zirconium 40 **Zr** 91.224	niobium 41 **Nb** 92.906	molybdenum 42 **Mo** 95.96	technetium 43 **Tc** [98]	ruthenium 44 **Ru** 101.07	rhodium 45 **Rh** 102.91	palladium 46 **Pd** 106.42	silver 47 **Ag** 107.87	cadmium 48 **Cd** 112.41	indium 49 **In** 114.82	tin 50 **Sn** 118.71	antimony 51 **Sb** 121.76	tellurium 52 **Te** 127.60	iodine 53 **I** 126.90	xenon 54 **Xe** 131.29
caesium 55 **Cs** 132.91	barium 56 **Ba** 137.33		hafnium 72 **Hf** 178.49	tantalum 73 **Ta** 180.95	tungsten 74 **W** 183.84	rhenium 75 **Re** 186.21	osmium 76 **Os** 190.23	iridium 77 **Ir** 192.22	platinum 78 **Pt** 195.08	gold 79 **Au** 196.97	mercury 80 **Hg** 200.59	thallium 81 **Tl** 204.38	lead 82 **Pb** 207.2	bismuth 83 **Bi** 208.98	polonium 84 **Po** [209]	astatine 85 **At** [210]	radon 86 **Rn** [222]
francium 87 **Fr** [223]	radium 88 **Ra** [226]		rutherfordium 104 **Rf** [261]	dubnium 105 **Db** [262]	seaborgium 106 **Sg** [266]	bohrium 107 **Bh** [264]	hassium 108 **Hs** [277]	meitnerium 109 **Mt** [268]	darmstadtium 110 **Ds** [271]	roentgenium 111 **Rg** [272]								

lanthanum 57 **La** 138.91	cerium 58 **Ce** 140.12	praseodymium 59 **Pr** 140.91	neodymium 60 **Nd** 144.24	promethium 61 **Pm** [145]	samarium 62 **Sm** 150.36	europium 63 **Eu** 151.96	gadolinium 64 **Gd** 157.25	terbium 65 **Tb** 158.93	dysprosium 66 **Dy** 162.50	holmium 67 **Ho** 164.93	erbium 68 **Er** 167.26	thulium 69 **Tm** 168.93	ytterbium 70 **Yb** 173.05	lutetium 71 **Lu** 174.97
actinium 89 **Ac** [227]	thorium 90 **Th** 232.04	protactinium 91 **Pa** 231.04	uranium 92 **U** 238.03	neptunium 93 **Np** [237]	plutonium 94 **Pu** [244]	americium 95 **Am** [243]	curium 96 **Cm** [247]	berkelium 97 **Bk** [247]	californium 98 **Cf** [251]	einsteinium 99 **Es** [252]	fermium 100 **Fm** [257]	mendelevium 101 **Md** [258]	nobelium 102 **No** [259]	lawrencium 103 **Lr** [262]

Chemical Symbols of the Elements

Symbol	Element	Symbol	Element	Symbol	Element	Symbol	Element	Symbol	Element	Symbol	Element
Ac	Actinium	**Cl**	Chlorine	**Ge**	Germanium	**Mo**	Molybdenum	**Pu**	Plutonium	**Tc**	Technetium
Ag	Silver	**Cm**	Curium	**H**	Hydrogen	**Mt**	Meitnerium	**Ra**	Radium	**Te**	Tellurium
Al	Aluminum	**Cn**	Copernicium	**He**	Helium	**N**	Nitrogen	**Rb**	Rubidium	**Th**	Thorium
Am	Americium	**Co**	Cobalt	**Hf**	Hafnium	**Na**	Sodium	**Re**	Rhenium	**Ti**	Titanium
Ar	Argon	**Cr**	Chromium	**Hg**	Mercury	**Nb**	Niobium	**Rf**	Rutherfordium	**Tl**	Thallium
As	Arsenic	**Cs**	Cesium	**Ho**	Holmium	**Nd**	Neodymium	**Rg**	Roentgenium	**Tm**	Thulium
At	Astatine	**Cu**	Copper	**Hs**	Hassium	**Ne**	Neon	**Rh**	Rhodium	**U**	Uranium
Au	Gold	**Db**	Dubnium	**I**	Iodine	**Ni**	Nickel	**Rn**	Radon	**Uun**	Ununnilium
B	Boron	**Ds**	Darmstadtium	**In**	Indium	**No**	Nobelium	**Ru**	Ruthenium	**Uuo**	Ununoctium
Ba	Barium	**Dy**	Dysprosium	**Ir**	Iridium	**Np**	Neptunium	**S**	Sulfur	**Uup**	Ununpentium
Be	Beryllium	**Er**	Erbium	**K**	Potassium	**O**	Oxygen	**Sb**	Antimony	**Uus**	Ununseptium
Bh	Bohrium	**Es**	Einsteinium	**Kr**	Krypton	**Os**	Osmium	**Sc**	Scandium	**Uut**	Ununtrium
Bi	Bismuth	**Eu**	Europium	**La**	Lanthanum	**P**	Phosphorus	**Se**	Selenium	**Uuu**	Ununumium
Bk	Berkelium	**F**	Fluorine	**Li**	Lithium	**Pa**	Protactinium	**Sg**	Seaborgium	**V**	Vanadium
Br	Bromine	**Fe**	Iron	**Lr**	Lawrencium	**Pb**	Lead	**Si**	Silicon	**W**	Tungsten
C	Carbon	**Fl**	Flerovium	**Lu**	Lutetium	**Pd**	Palladium	**Sm**	Samarium	**Xe**	Xenon
Ca	Calcium	**Fm**	Fermium	**Lv**	Livermorium	**Pm**	Promethium	**Sn**	Tin	**Y**	Yttrium
Cd	Cadmium	**Fr**	Francium	**Md**	Mendelevium	**Po**	Polonium	**Sr**	Strontium	**Yb**	Ytterbium
Ce	Cerium	**Ga**	Gallium	**Mg**	Magnesium	**Pr**	Praseodymium	**Ta**	Tantalum	**Zn**	Zinc
Cf	Californium	**Gd**	Gadolinium	**Mn**	Manganese	**Pt**	Platinum	**Tb**	Terbium	**Zr**	Zirconium

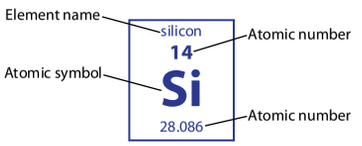
Essential Plant Nutrients



hydrogen 1 H 1.0079																	helium 2 He 4.0026
lithium 3 Li 6.941	beryllium 4 Be 9.0122											boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180
sodium 11 Na 22.990	magnesium 12 Mg 24.305											aluminium 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948
potassium 19 K 39.098	calcium 20 Ca 40.078	scandium 21 Sc 44.956	titanium 22 Ti 47.867	vanadium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.38	gallium 31 Ga 69.723	germanium 32 Ge 72.64	arsenic 33 As 74.922	selenium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.798
rubidium 37 Rb 85.468	strontium 38 Sr 87.62	yttrium 39 Y 88.906	zirconium 40 Zr 91.224	niobium 41 Nb 92.906	molybdenum 42 Mo 95.96	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	palladium 46 Pd 106.42	silver 47 Ag 107.87	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29
caesium 55 Cs 132.91	barium 56 Ba 137.33		hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]
francium 87 Fr [223]	radium 88 Ra [226]		rutherfordium 104 Rf [261]	dubnium 105 Db [262]	seaborgium 106 Sg [266]	bohrium 107 Bh [264]	hassium 108 Hs [277]	meitnerium 109 Mt [268]	darmstadtium 110 Ds [271]	roentgenium 111 Rg [272]							

lanthanum 57 La 138.91	cerium 58 Ce 140.12	praseodymium 59 Pr 140.91	neodymium 60 Nd 144.24	promethium 61 Pm [145]	samarium 62 Sm 150.36	europium 63 Eu 151.96	gadolinium 64 Gd 157.25	terbium 65 Tb 158.93	dysprosium 66 Dy 162.50	holmium 67 Ho 164.93	erbium 68 Er 167.26	thulium 69 Tm 168.93	ytterbium 70 Yb 173.05	lutetium 71 Lu 174.97
actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa 231.04	uranium 92 U 238.03	neptunium 93 Np [237]	plutonium 94 Pu [244]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	einsteinium 99 Es [252]	fermium 100 Fm [257]	mendelevium 101 Md [258]	nobelium 102 No [259]	lawrencium 103 Lr [262]

Essential Human Nutrients



hydrogen 1 H 1.0079																	helium 2 He 4.0026
lithium 3 Li 6.941	beryllium 4 Be 9.0122											boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180
sodium 11 Na 22.990	magnesium 12 Mg 24.305											aluminium 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948
potassium 19 K 39.098	calcium 20 Ca 40.078	scandium 21 Sc 44.956	titanium 22 Ti 47.867	vanadium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.38	gallium 31 Ga 69.723	germanium 32 Ge 72.64	arsenic 33 As 74.922	selenium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.798
rubidium 37 Rb 85.468	strontium 38 Sr 87.62	yttrium 39 Y 88.906	zirconium 40 Zr 91.224	niobium 41 Nb 92.906	molybdenum 42 Mo 95.96	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	palladium 46 Pd 106.42	silver 47 Ag 107.87	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29
caesium 55 Cs 132.91	barium 56 Ba 137.33		hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]
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Sources of Essential Nutrients

Name _____ Date _____

Essential Nutrient	Source		
	Air	Water	Soil
Boron (B)			
Calcium (Ca)			
Carbon (C)			
Chlorine (Cl)			
Copper (Cu)			
Hydrogen (H)			
Iron (Fe)			
Magnesium (Mg)			
Manganese (Mn)			
Molybdenum (Mo)			
Nickel (Ni)			
Nitrogen (N)			
Oxygen (O)			
Phosphorus (P)			
Potassium (K)			
Sulfur (S)			
Zinc (Zn)			

Spice It Up

Subjects Taught: Science, Health, Nutrition, Social Studies

Grade Levels: 6th-12th Grade

Brief Description: This lesson is a sensory exploration of the herbs and spices that create food scents and flavors with a mystery twist- geographic and cultural examination. Herb growing in the garden will be encouraged. Students will be asked to explore antioxidants, vitamins, minerals and phytonutrients that herbs provide.

Objectives: Students will:

1. Grow herbs in the school garden.
2. Describe how herbs and spices flavor and enhance the foods we eat.
3. Explore a specific cultural recipe and describe the use of spices and herbs.
4. Research phytonutrients and create a poster project with details.
5. Compare and contrast claims versus scientific evidence the use of herbs for nutritional enhancements, medicinal preventatives and alternative medications by researching and debating their use, benefits and possible harm.

Life Skills: Appreciating, assessing credibility, comparing similarities and differences, debating, evaluating, examining claims, researching and understanding cause and effect

Materials Needed:

- Herb seeds
- Potting soil
- Peat pots
- Computers with Internet access

Time:

Activity One: Two, 30-minute sessions
Activity Two: Two, 45-minute sessions plus time for student research
Activity Three: 45 minutes plus time for student research
Activity Four: Two, 45-minute class periods plus time for student research

Preparation:

1. Gather materials to plant seeds and transplant seedlings.
2. Plan an area in the school garden for growing herbs.
3. Ensure students will have Internet access.

Vocabulary: herbs, phytonutrients, spices

Background Information:

Herbs and spices have been used by people for centuries for culinary, medicinal and even religious purposes. In general, herbs are considered those flavorings that come from the vegetative part of the plant, most often leaves and roots. Herbs such as parsley, bay leaves, oregano, summer savory, thyme, sage, basil, and marjoram are leaves. Spices are most often seeds, seed pods, and fruit (usually dried). Black pepper, chili pepper, nutmeg, sesame, mace, mustard, vanilla, chocolate, kola, celery seed, turmeric, and almond are seeds, seed pods or fruit. Of course, there are exceptions – ginger is from a root,

Florida Standards Met At-A-Glance

National Next Generation Science	MS-LS2-1, HS-ESS3-1
English/Language Arts	6.RI.1.2, 6.RI.3.8, 7.RI.3.8, 8.RI.1.2, 8.RI.3.8, 8.RI.3.9, 910.RI.1.1, 910.RI.3.8, 1112.RI.1.1, 1112.RI.3.7, 6.W.1.1, 6.W.1.2, 6.W.3.7, 6.W.3.8, 7.W.1.1, 7.W.1.2, 7.W.2.6, 7.W.3.7, 7.W.3.8, 8.W.1.1, 8.W.1.2, 8.W.2.6, 8.W.3.7, 8.W.3.8, 910.W.1.1, 910.W.1.2, 910.W.2.6, 910.W.3.7, 910.W.3.8, 910.W.3.9, 1112.W.1.1, 1112.W.1.2, 1112.W.2.6, 1112.W.3.7, 1112.W.3.8, 1112.W.3.9, 6.SL.1.1, 6.SL.1.2, 6.SL.2.5, 7.SL.1.1, 7.SL.2.4, 7.SL.2.5, 8.SL.1.1, 8.SL.2.4, 8.SL.2.5, 910.SL.1.1, 910.SL.1.2, 910.SL.2.4, 910.SL.2.5, 1112.SL.1.1, 1112.SL.1.2, 1112.SL.2.4, 1112.SL.2.5, 68.RST.1.2, 68.RST.3.7, 68.RST.3.8, 910.RST.3.9, 1112.RST.1.2, 1112.RST.2.6, 68.WHST.1.1, 68.WHST.2.6, 68.WHST.3.7, 68.WHST.3.9, 910.WHST.1.1, 910.WHST.3.7, 1112.WHST.1.1, 1112.WHST.3.7, 1112.WHST.3.9
Social Studies	SS.6.G.1.4, SS.8.E.3.1, SS.912.A.1.6
Health	HE.6.B.1.1, HE.6.B.1.7, HE.6.B.3.1, HE.6.B.3.4, HE.7.B.1.1, HE.7.B.1.7, HE.7.B.3.1, HE.7.P.2.1, HE.8.B.1.1,HE.912.B.1.1

cinnamon is from the bark of a tree, saffron is the actually stamens of crocus flowers.

Plants produce chemicals for a number of reasons - to repel or discourage pests from eating them, to encourage pollinators and to encourage some animals to eat them and disperse the seeds while repelling others. For example, scientists have discovered that mammals can experience the heat of spicy hot peppers while birds cannot. Pepper seeds traveling through the digestive systems of mammals are damaged or even digested by some mammals. When the remnants are spread in the animal's waste, the seeds are no longer capable of germinating and producing new plants. However, pepper seeds digested by a bird pass through its system unharmed, are spread in the environment, and then germinate and produce new plants. So the bird is the preferred consumer of pepper fruits. Mammals are not. The hot spice of the peppers dissuades mammals from consuming peppers leaving them available for birds to eat.

Herbs and spices have been used for thousands of years as medicines long before modern medicine developed drugs. Some plants do produce chemicals that are beneficial as medicines. In fact, even today, about a quarter of all modern medicines are synthesized from plants. Willow bark tea has been used by many societies to relieve pain and reduce inflammation. The active property is salicylic acid, which is a plant hormone, and is the ingredient that makes aspirin effective at reducing pain and inflammation as a metabolite of aspirin. Modern research is currently examining medicinal claims about a wide range of herbal remedies and possibilities of plant materials. It is finding truth in some claims, cancer cures in others and no substance at all in others. The whole field of anti-oxidants and phytonutrient research (such as the often-hyped resveratrol) is just beginning.

Plants produce chemicals that provide a wide array of scents and flavors. Human use these in cooking to create an immense variety of foods. Each culture has specific flavors that make their cuisine unique and part of their culture. Some of these flavors and scents will be well known by students and others will be new experiences.

Herbs in the Kitchen

Herbs are one of the easiest plants to grow and are in almost every dish of every meal we eat. Herbs added to food can make the difference between dull and delicious. Herbs are also used as an ingredient in soaps, shampoos, perfumes, bath powders and skin moisturizers. Almost half of all medicines include herbs as a significant ingredient, whether extracted from the actual plant or synthesized in the lab. Herbs can also be appreciated as decorative items and crafted into wreaths and potpourris.

With the renewed interest in locally grown, natural and organic food and medicines, people are rediscovering the many inherent benefits and uses of herbs. The importance of herbs is based on their ability to comfort and uplift which can be enjoyed simply by looking at, sniffing or observing them grow, bloom and bear seeds and eventually sharing them with others. Examples of popular herbs include: mint, lavender, basil, rosemary, parsley, sage, thyme and aloe vera.

Easy ways to use herbs:

- Freshen breath
- Flavor food
- Garnish foods
- Add to beverages
- Help with personal hygiene
- Used as medicine
- Debug indoor and outdoor spaces
- Neutralize odors
- Used as a sleep aid

An herb (pronounced 'erb' with a silent 'h' in the U.S.) is defined as any part of a plant with culinary, aromatic, cosmetic, insecticidal, insect-attracting or dye-making characteristics. Herbs are easily grown in temperate climates. The most useful part of the herb plant is the leaf or flower. The difference between herbs and spices are that spices are described as strongly flavored, aromatic substances, that primarily come from bark, root, berry or pods grown on a vine, shrub or tree. Spices grow best in tropical regions of the eastern hemisphere as they don't grow well in temperate climates or home gardens.

Herbs are easy to grow and widely available, but are sometimes mistaken for weeds or other non-edible/toxic plants. Herbs can be started from seeds or cuttings and grown in small informal plots or incorporated in your existing gardens as well as in pots on sunny windowsills. It's important to identify an herb before eating it as there are many look-alikes and plants look different at different times of the year and in different climates. These look-alike plants can be toxic or even fatal depending on the amount eaten.

Source: Ortho's Guide to Herbs, Created and Designed by the Editorial Staff of Ortho Books
Author – Monica Brandies

Activity One:

1. Grow herbs in the school garden: basil, chives, dill, oregano, parsley, rosemary, sage and tarragon are easily grown and several will be familiar scents to students.
   a. Plant seeds in peat pots indoors to begin growth six to eight weeks prior to planting the school garden.
   b. Transplant seedlings into the school garden after the danger of frost has passed.
   c. Once the plants are growing well, keep them trimmed by harvesting the leaves and prevent the herbs from flowering and setting seed. Annual plants will often die after setting seed.
2. When the herbs are growing well, snip off portions of leaves and stems, crush to release the essential oils and place them into small paper bags.
3. Using a blind smelling test by placing herbs in paper bags, have students sniff the herbs and try to identify what the herb is and/or what foods this herb might be used in. Place a number on each bag and have the students write down what they think they smell. Once the entire class is done guessing go over the correct answers.
4. Have students select one of the herbs grown in the school garden and research what vitamins, minerals and/or phytonutrients the herb provides.
5. Discuss the commonly used delineation between herbs and spices. Herbs are commonly referred to as the leaves and stems of non-woody plants that are generally grown in temperate regions. Spices are commonly referred to as the seeds, fruit, woody portions, or flavorings grown in tropical regions.

Activity Two:

1. Use "Spices History" video by Taylor Roberts at www.youtube.com to introduce the variety of spices and herbs, the cultural connections, and sensory delights. This video has only images, words, and music. Discuss that the food flavors we enjoy today come from around the world and some right at home and they have quite a history.
2. Have students select a food that is unique to their cultural heritage that contains herbs and spices.
   a. Instruct the students to either obtain a family recipe for that food or seek a recipe online.
   b. From the recipe, determine what the major ingredients are and especially which herbs and spices are used.
3. Using the Internet, have students view "Cultural Interactions with Spices and Herbs" www.youtube.com and decide what they like and don't like about this presentation and the previous one and use it to guide their own research and production of a PowerPoint presentation or video. NOTE: If your school has prohibitions on use of YouTube, many clips can be downloaded outside of school and broadcast from a laptop computer. Or it may be possible to obtain special permission for a single use.
4. As a class, create an evaluation rubric to use for evaluating presentations.
5. Have students prepare and present electronic enhancements detailing the use of specific herbs and spices in a dish representative of his or her ancestral or current culture.
   a. Research where the fruit and vegetable ingredients and the herb and spices that contribute to the uniqueness of their recipe originated, and how these herbs and spices traveled to the location of the culture the recipe represents. In addition, describe where these herbs and spices are produced today, and how or when their families consume these food items.
   b. Use this information to create either a PowerPoint presentation or video and post the video online with either a cultural or herbal connection in the title.
   c. Present the program to the class.
6. Members of the class ask questions, score each presentation, give the presenter feedback, and provide the teacher with the score using the rubric developed by the class.

Activity Three:

1. Introduce the topic that herbs are in the news as nutritional enhancements, preventative medicinal approaches, or curative alternatives to modern medicines.
2. Discuss how herbal treatments have been used as medicines for thousands of years. In fact, for most of that time those were the only medicines available and there is validity to that use. Today, more than 25 percent of our medicines come directly from plant sources. We are learning more every day not just about nutrition but about phytonutrients. Ask: "What are phytonutrients?"
3. Have students research phytonutrients and create a poster project in teams of two or three students. Good information sources can be found at the USDA and Agri-Food Canada. Also Web MD has a good summary written by USDA Scientists at www.webmd.com.

Activity Four:

1. Ask students what herbal supplements they have heard of and make a master list. If they have not heard of any, assign them to read magazines, watch television doctor shows or morning talk shows that discuss herbal remedies, watch infomercials for nutritional supplements, visit websites or online health food stores and read the claims of herbal supplements.

2. Divide the class into three groups and prepare for a debate on the use of herbal supplements as nutritional supplements that improve human health, and prevent and cure disease.
   a. One group should research the positives of herbs that are currently being promoted and/or sold as nutritional supplements, or preventative or curative disease measures and be the "pro" side of the debate.
   b. The second group should research the negatives to challenge those claims and be on the "con" side of the debate.
   c. The third group will be the judges and decide the outcome of the debate. This group should have no more than five team members. This group will develop a rubric to evaluate the debate, research challenges they can make to the debaters on both sides and create questions to pose during the debate.
   d. The debate should include: 1. Opening statements from both sides. 2. A challenge by both sides. 3. Following each opening statement, judges should pose questions and solicit responses to those questions from both sides. 4. Closing statements from both sides. The scoring rubric should contain all those components for scoring.
3. Have students access the National Center for Complementary and Alternative Medicine at the National Institutes of Health at www.nccam.nih.gov, which is an excellent source of information for a summary of the research findings that are based on sound, peer-reviewed science. Prepare for a debate about the advisability of using these herbs for their promoted purpose. Include whether they are effective for their promoted purpose, if the research is conclusive, if research is being conducted and if there are any warnings for consuming this herb or interactions with medicines or foods. Require students to provide a list of sources used to support their claims and indicate that they will receive a grade on their reference list.
4. Conduct the debate and have students score the process and results.
5. Discuss the information presented and what evaluating the claims means to students. Ask if debating the use of these products has informed the students, encouraged the use of these items or discouraged the use of these items. What process will the student use in the future to examine claims about the health benefits of these products?

Evaluation Options:

1. Evaluate student contributions to the success of the school garden.
2. Assess student cooperation, participation and contributions to the scoring rubric.
3. In activity two, use the scoring rubric to evaluate the presentations and incorporate the scores of classmates in your score and let them know in advance how much weight their peers' scores will count. (50/50, 60/40, 40/60).
4. Have students make a list of dishes that would not have the same recognizable smells and flavors without herbs and spices.
   Examples:
   Sage, onion– turkey dressing
   Oregano, garlic and bay leaves – pizza
   Cinnamon, nutmeg – apple pie
   Ginger – ginger bread, ginger snaps, ginger ale
   Bay leaves, onion, garlic – spaghetti
   Cinnamon – cinnamon candies and gum
   Garlic, mustard seed, celery seed – sweet bread and butter pickles
   Dill , garlic – dill pickles
   Ginger, cinnamon – pumpkin pie
   Vanilla – vanilla ice cream, vanilla frosting, vanilla pudding, sugar cookies
   Garlic, soy sauce, onions – Chinese foods
   Basil, garlic – pesto sauce
5. Evaluate student poster projects on phytonutrients.
6. Assess student performance on the debate, including the list of references, thoroughness of research, ability to make the case both pro and con, the rubric developed, questions developed and the scoring and ability to answer questions on herbal uses as nutritional supplements or medicinal alternatives.

Extensions or Variations:

1. Use the History of Spices video to clear up some misconceptions about historic spice use www.youtube.com
2. Use the Florida Agriculture in the Classroom lesson "Around the World in 500 Years" at the Teacher Center of its website at www.faitc.org that discusses how trade and travel introduces invasive species.
3. Have a chef come in or work with the culinary arts department to cook with the herbs, determine food pairing, or just discuss how to cook with herbs and spices for healthy low sodium options.

Resources:

"Cultural Interactions with Spices and Herbs," University of Hawaii
www.youtube.com

National Center for Complementary and Alternative Medicine, National Institutes of Health
www.nccam.nih.gov

Roberts, Taylor. "Spice History" video.
www.youtube.com

Frequently Asked Questions about Phytonutrients, Web MD (Written by USDA Scientists)
www.webmd.com

Spice It Up!

Sample Pre-Post Assessment

1. List three uses for herbs.

2. Pick three herbs and identify how they are used in dishes of different cultures.

3. What are phytonutrients? Give an example.

4. Describe how to evaluate medical claims of those selling herbal supplements.

Survival Florida

Subjects Taught: Health, Social Studies, English Language Arts

Grade Levels: 6th-12th Grade

Brief Description: Using a WebQuest, students will research foods grown in Florida and nutritional requirements of different age groups to determine if survival consuming only foods from Florida is possible.

Objectives: Students will:

1. Work in a small group to complete a WebQuest.
2. Create a visual aid to present WebQuest findings.
3. Determine as a class if survival (meeting their nutritional needs) is possible consuming only foods grown in Florida.

Life Skills: Analyzing and interpreting data, collaborating, communicating, cooperating, creative thinking, developing research skills, evaluating, following directions, making connections, note taking, obtaining information, synthesizing information

Materials Needed:

- WebQuest handout
- Computers with Internet access
- Art supplies (optional)

Time:

Total Time: Three, 45-minute sessions plus time for research

Preparation:

1. Print enough WebQuest sheets so that each student will have his or her own copy, or provide students with the link to the electronic version of the WebQuest at http://zunal.com/webquest.php?w=179338.
2. Schedule at least two days in the library for use of the computers, or two days in the classroom with a class set of computers.

Introduction:

Students will be given a WebQuest (either the printed one provided in this lesson or an electronic version at http://zunal.com/webquest.php?w=179338. It has the specific resources identified to aid in their research about foods grown in Florida, the nutritional requirements of different age groups, and a comparison of what is grown in Florida to students' nutritional requirements.

Activity One:

1. Print out the two-page WebQuest sheet and provide each student with a copy.
2. Divide students into groups of three.
3. Hand out WebQuest sheets and review with students. Provide at least two class periods for students to conduct their research using either classroom laptops or the media center computers.

Activity Two:

1. After completing their research, have each group of students prepare a visual that explains their findings.

Florida Standards Met At-A-Glance

National Next Generation Science	MS-LS2-b., MS-ESS3-c., HS-ESS3-a
English/Language Arts	6.RI.1.1, 6.RI 2.4, 6.RI 3.7, 6.W 1.1, 6.W 1.2, 6.W.2.4, 6.W.2.6, 6.W.3.7, 6.W.3.8, 6.SL.1.1, 6.SL.2.4, 6.SL.2.5, 6.SL2..6, 7.RI 1.1, 7.RI.2.4, 7.W.1.1, 7.W.1.2, 7.W.2.4, 7.W.2.6, 7.W.3.7, 7.W.3.8, 7.SL.1.1, 7.SL.2.4, 7.SL.2.5, 7.SL.2.6, 8.RI.11, 8.RI.2.4, 8.W.1.1, 8.W.1.2, 8.W.2.4, 8.W.2.6, 8.W.3.7, 8.W.3.8, 8.SL.1.1, 8.SL.2.4, 8.SL.2.5, 8.SL.2.6, 910.RI.1.1, 910.RI.2.4, 910.W.1.1, 910.W.2.4, 910.W.2.6, 910.W.3.7, 910.W.3.8, 910.SL.1.1, 910.SL.1.2, 910.SL.2.4, 910.SL.2.5, 910.SL.2.6, 1112.RI.1.1, 1112.RI.2.4, 1112.W.1.1, 1112.W.2.4, 1112.W.2.6, 1112.W.3.7, 1112.W.3.8, 1112.SL.1.1, 1112.SL.1.2, 1112.SL.2.4, 1112.SL.2.5, 1112.SL.2.6
Health Education	HE.6.B.1.7, HE.7.B.1.7, HE.7.C.2.6, HE.8.B.1.7, HE.912.B.1.3, HE.912.B.1.6

2. Have each group present their visual to the class.
3. Once all group presentations are completed, discuss with students whether or not it would be possible to survive and meet all of their nutritional requirements if only the food from Florida were available.

Evaluation Options:

1. See evaluation section of WebQuest handout for rubric.
2. Have students write an essay detailing why they believe or do not believe that it is possible to survive only on Florida produced foods and whether they would want to.
3. Have students research and answer the question in writing, "Would it be possible to survive consuming only the foods produced within a single state?" Identify the state or states, and ask them to provide detail.

Extensions and Variations:

1. The WebQuest provided has two major components: Foods grown in Florida and Nutritional Requirements for the different age groups. If teaching middle school, it may be easier (and less overwhelming to students) to select one of these topics at a time to research, beginning with foods grown in Florida or split the class in half and give one group one topic and the other group the other topic.

Resources:

WebQuest document or electronic WebQuest found at www.zunal.com

Credits:

Links from the WebQuest that students will visit:

www.florida-agriculture.com

www.freshfromflorida.com/content/download/36315/838961/AgByTheNumbers.pdf

www.nass.usda.gov/Statistics_by_State/Florida/index.asp

www.nutrition.gov/life-stages

www.mayoclinic.com/health/nutrition- for-kids/NU00606

www.diet.com/g/adult-nutrition

www.cdc.gov/nutrition/everyone/basics/index.html

Survival Florida WebQuest

Introduction:	As an agricultural detective, you've been assigned the task of investigating the availability of food sources to residents in the state of Florida. It seems there are some discrepancies among what citizens believe to be transported into the state, as opposed to what is actually grown in the state. The sergeant of the detective squad has asked you and your team to gather some information to share with the citizens about the produce grown in Florida. In addition to learning about the products grown in Florida, you will further your investigation by determining the nutritional requirements for different age groups. Follow the guidelines provided below to complete the research process of this discrepancy and be prepared to discuss your findings with the citizens. You will work in groups of three to gather information to create a poster-like presentation of your findings.
Task:	After completing this investigation, you will need to present your findings to the citizens of Florida (your classmates). You will create a visual to display the new found information you've gained from your research. You may create a poster, PowerPoint, Prezi (www.prezi.com), short video, board game, etc. Be creative. Use your notebook to take notes on your findings.
The Process:	**Objective:** You will be comparing foods grown in Florida, as well as in other states around the United States. As a group you will research the nutritional requirements of different age groups and evaluating if the foods grown in Florida meet those requirements. The group will research the following: • Does Florida grow enough variety of foods to meet the nutritional requirements of the different age groups? If so, explain. If no, what is missing? • What foods are grown in Florida? • Compare foods grown in Florida to six other states. • Explanation of the nutritional requirements for infants, children, adolescents, men, women and seniors • Does food grown in Florida meet the nutritional requirements for each age group? 1. First, you will be assigned to a group of three students. 2. Your group should make a plan for gathering information. There is a lot of information that needs to be gathered and synthesized so plan accordingly. 3. You should use some form of note-taking to keep organized with all this information. You can use any system that is best for you. Some suggestions include using a flow cart, summary tables, concept map, word web, charts or a KWL table. (What you know (K). What you want to know (W). What you learned (L).) 4. Use a classroom laptop (or library computer) to conduct your research. Your sergeant has provided you with the following websites to guide your explorations on produce grown in Florida and other states: • Investigate the foods grown in Florida. http://www.freshfromflorida.com/Divisions-Offices/Marketing-and-Development/Education/For-the-Community/Marketing-Brochures-and-Print-Resources/Agriculture-in-General • Learn the seasons of availability for produce grown in Florida. http://www.freshfromflorida.com/content/download/16790/269889/P-01332.pdf • Consider the tropical foods grown in Florida. http://www.tfgsf.com/ • What about herbs? http://www.freshfromflorida.com/content/download/16804/269987/P-01333.pdf • Explore the U.S. Department of Agriculture webpage. Under the section titled "Statistics by State" select other states and compare the available products grown. Choose at least two states on the Pacific Coast, two states in the Midwest, two states in the Northeast, and two states in the Southeast. Once you select a state, click on the state Facts Sheet in the middle of the page, to review. Be sure to look specifically for produce grown,but also note other agricultural products grown in these states (such as beef, pork, dairy, etc.). Take notes on your comparisons of these states. www.nass.usda.gov/Statistics_by_State/

Survival Florida WebQuest

(continued)

The Process: (continued)	5. Now that you know about the products grown in Florida, you can now expand your investigation to determine the nutritional requirements of different age groups. • Nutrition.gov Life Stages: http://www.nutrition.gov/life-stages • Additional sites to explore: -Recommendations for Children - Use the links on the left to explore the different age ranges (ages 2 to 18) http://www.mayoclinic.com/health/nutrition-for-kids/NU00606 - Recommendations for Adults - http://www.diet.com/g/adult-nutrition • Nutrition Basics from the Center for Disease Control and Prevention. http://www.cdc.gov/nutrition/everyone/basics/index.html 6. In your groups organize all the information you have researched and create a visual presentation. Make sure you have read over the rubric and understand where your grade is coming from.
Evaluation:	You will submit your notes separately for a grade. Your group's visual and presentation will be graded with the following criteria: - Visual aid's appeal, ease of reading and overall attractiveness: 10 points - Thorough explanation of foods grown in Florida: 40 points - Comparison of foods grown in Florida to the other six states: 20 points - Explanation of nutritional requirements for infants, children, adolescents, men, women and seniors: 40 points - Explanation of whether foods grown in Florida meet the nutritional requirements of each age group or not: 30 points - Team involvement (did you pull your own weight in this project?): 10 points Total: 150 points
Conclusion:	Congratulations Detective! You have successfully compiled the information necessary to educate citizens on the nutritional recommendations as it relates to the foods grown in Florida. Remember that although agriculture may not always seem significant in your lives, it is what feeds you, clothes you and provides a home for you. Florida is a unique state in that it grows so much produce throughout the year, and as Florida residents, you have the opportunity to enjoy this diverse produce! Good work.

Cucumber-Mint Water

Try This Florida Recipe

Ingredients

- 1⁄3 cup fresh mint leaves
- 1⁄2 cucumber, peeled and thinly sliced
- 1 1⁄2 quart cold water

*You can replace cucumbers with your favorite Florida fruit.

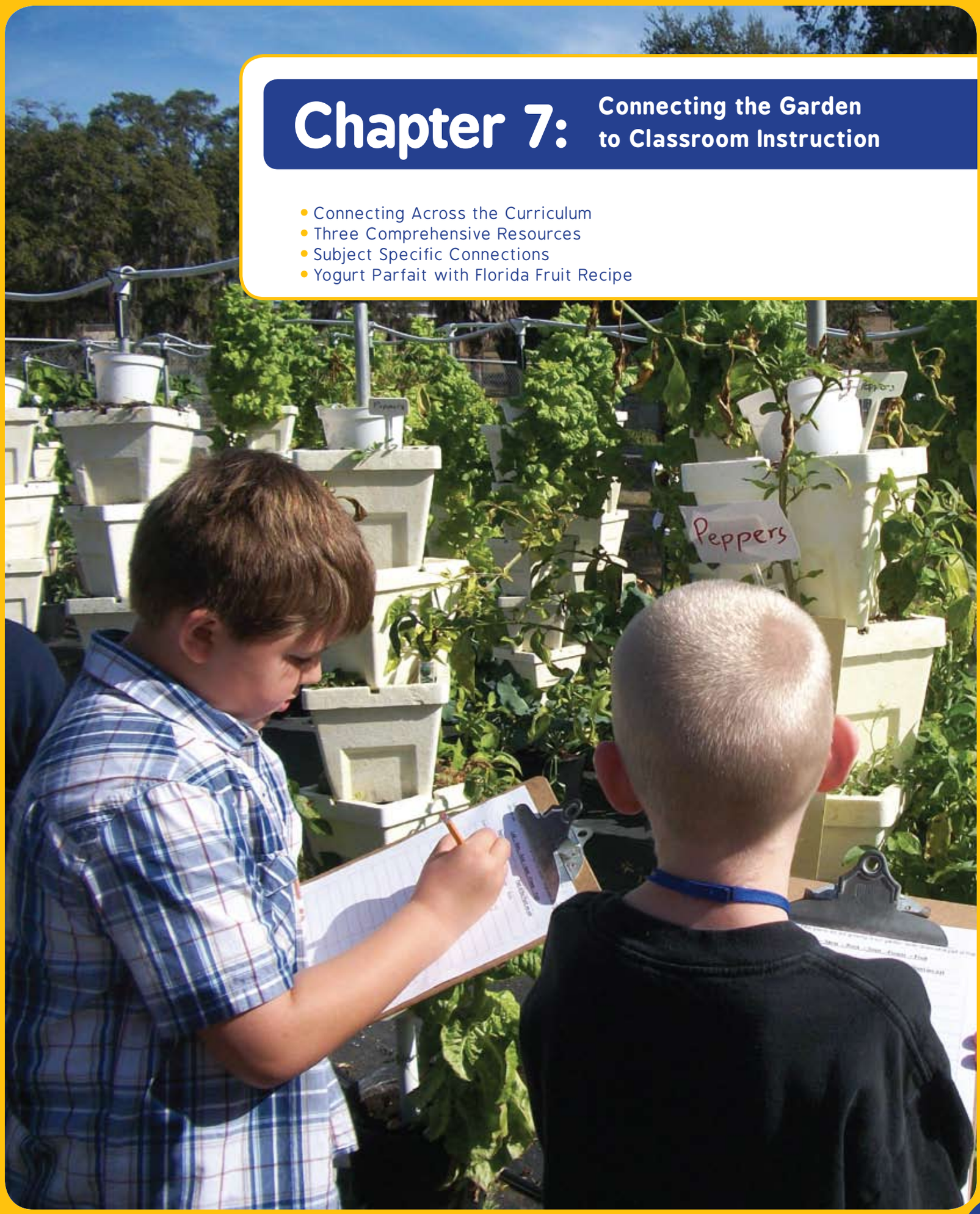
Instructions

- Wash your hands with soap and water, then gather all your kitchen gear and ingredients and put them on a clean counter.
- Put the mint leaves in the pitcher and use the wooden spoon to gently mash and stir until they look a little bit bashed up.
- Add the cucumber slices and water, stir, and put the pitcher in the fridge for at least 15 minutes. Strain out the mint and cucumber, if you like, and serve right away.

Fresh from Florida

Chapter 7: Connecting the Garden to Classroom Instruction

- Connecting Across the Curriculum
- Three Comprehensive Resources
- Subject Specific Connections
- Yogurt Parfait with Florida Fruit Recipe



Connecting Across the Curriculum

It is possible to connect activities in the garden to the curriculum in almost every subject at all grades. These are just a few suggestions to begin the process of making those connections. This section is divided into major subject categories of language arts, mathematics, science, social studies with subheadings on specific topics or curriculum areas. Several ideas will fit into multiple curriculum areas, such as the concept of timelines.

The Food Timeline is an amazing website at www.foodtimeline.org with information on almost every food known to man. So where should it be placed in classroom instruction? For example it involves:

Timelines are used as an organizational tool in social studies, but the process of skill and concept development to create and utilize timelines falls into mathematics, too. So, for organizational purposes, timelines can be placed in one category with suggestions for use in other curriculum areas. They have been used as an example here. Timelines do not need to be repeated in every category.

The Food Timeline

Language arts	Recommended books for all ages Etymology of various bread names and foods Quotations
Languages other than English	German cookbook in German Swedish American Cookbook in both Languages Foods of almost all countries
Sciences of all types	Biology — yeast, fruits, vegetables, grains, fungi, Chemistry of baking soda and baking powder, pH, buffering, potash, muriatic acid, cream of tartar Technology
Social studies	History of food and historical connections Food's influence on cultures Geography of where foods originated, how they traveled, evolution of foods due to geography and topography Foods of every culture from ancient civilizations to today
Mathematics	Collecting data, displaying data, reading graphical data displays Measurement Time Cost Analyses
Health/Physical Education	Nutrition

Three Comprehensive Resources

There are three resources available that have already connected food and agriculture across all subject areas that use an array of teaching techniques and are technically sound. Florida Agriculture in the Classroom, Inc. (the organization that developed this resource) has K-12 lessons searchable on its website by grade level, subject area and commodity at www.faitc.org. Teachers can either search its website or attend a workshop to receive copies of these lessons.

Florida Agriculture in the Classroom Inc. is also the state coordinating organization for Project Food, Land & People's (FLP) *Resources for Learning*. FLP is a national program that provides *Resources for Learning* (currently 55 PreK-12th grade lessons) and *Eat Well, Be Well* (nine nutrition lessons) and has six new lessons under development.) The FLP *Resources for Learning* and *Eat Well, Be Well* are also available by attending a workshop or visiting www.foodlandpeople.org. Sample FLP lessons are available on the website for free. It may be possible to receive both by attending the same training session.

The third resource is the National Agriculture in the Classroom Organization's website with access to resources developed in almost every state at www.agclassroom.org. This program has a National Resource Directory that is searchable by topic, subject, state and grade level.

Subject Specific Connections

Language Arts
(Topics listed alphabetically by author.)

Early Elementary Books

Brisson, Pat, *The Summer My Father Was Ten*. Boyds Mills Press. ISBN: 1-56397-435-5 and ISBN: 1-56397-829-6

Gibbons, Gail. *From Seed to Plant.* ISBN: 0-8234-1025-0

Mallett, David. *Inch by Inch*. HarperTrophy. 1997. ISBN: 0-06-443481-8

Ray, Deborah Kogan. *Lily's Garden*. Amazon Remainders Account. ISBN: 0-76-131593-4

Rylant, Cynthia. *This Year's Garden*. ISBN: 0-689-71122-0

Stevens, Janet. *Tops and Bottoms*. Hartcourt Children's Books. 1995.

Tamar, Erika. *The Garden of Happiness.* Harcourt Children's Books. 1996. ISBN: 0-15-230582-3

Books for All Ages and Teacher Resources

American Farm Bureau Foundation for Agriculture® Recommended Book List
www.agfoundation.org

Social Studies
(Listing is chronological.)

The Food of Christopher Columbus
http://toriavey.com/history-kitchen/2012/10/what-christopher-columbus-discovered-foods-of-the-new-world

George Washington
http://www.whitehouse.gov/about/presidents/georgewashington

George Washington Pioneer Farmer
www.mountvernon.org/learn/explore_mv/index.cfm/ss/31

George Washington's Gardens at Mount Vernon
http://www.mountvernon.org/gardens

Thomas Jefferson
www.monticello.org/jefferson/index.html
www.whitehouse.gov/about/presidents/thomasjefferson

Jefferson's Monticello Gardens and Grounds
www.monticello.org/gardens/index.html

Jefferson: Scientist and Gardener (Also useful in science.)
www.monticello.org/gardens/vegetable/science_gardener.html

Presidential Foods for All Presidents from Washington to Obama
www.foodtimeline.org/presidents.html

Pioneer Foods
www.foodtimeline.org/foodpioneer.html

Irish Potato Famine
www.historyplace.com/worldhistory/famine
www.school.discoveryeducation.com/lessonplans/programs/forcedtoflee

Civil War Foods
www.civilwaracademy.com/civil-war-food.html
www.sonofthesouth.net/leefoundation/civil-war/1861/november/civil-war-food.htm

George Washington Carver (Also useful in science.)
Biography
www.foodtimeline.org/index.html
www.inventors.about.com/od/cstartinventors/a/GWC.htm
www.notablebiographies.com/Ca-Ch/Carver-George-Washington.html

Instruction from George Washington Carver about Tomatoes (There are also instructions for sweet potatoes and peanuts.) (Also suitable for science.)
www.aggie-horticulture.tamu.edu/vegetable/additional-resources/carver-tomato

Civil War soldiers relaxing and eating hard tack.

World War I, World War II Victory Gardens
www.nationalww2museum.org/learn/education/for-students/ww2-history/at-a-glance/victory-gardens.html
www.amhistory.si.edu/house/yourvisit/victorygarden.asp
www.history.nd.gov/exhibits/gardening/militaryevents7.html
www.sidewalksprouts.wordpress.com/2008/04/14/wwii

World War II Food
www.u-s-history.com/pages/h1674.html
www.livinghistoryfarm.org/farminginthe40s/money_02.html

The Green Revolution, Norman Borlaug (Also suitable for science and language arts.)
www.nobelprize.org/nobel_prizes/peace/laureates/1970/borlaug-bio.html
www.theatlantic.com/past/docs/issues/97jan/borlaug/borlaug.htm
www.agbioworld.org/biotech-info/topics/borlaug/index.html

Norman Borlaug Curriculum
www.normanborlaug.org/education/curriculum.html

List of books compiled by the Library of Congress on Presidential Food.(Also useful in language arts.)
www.loc.gov/rr/scitech/SciRefGuides/presidentialfood.html

Mathematics

(Topics listed alphabetically.)

Buying Watermelons Intelligently
www.demonstrations.wolfram.com/BuyingWatermelonsIntelligently

Census of Agriculture Educational Materials
www.nass.usda.gov/Education_and_Outreach/index.asp

Census Fact Sheets (Also suitable for social studies.)
www.agcensus.usda.gov/Publications/2007/Online_Highlights/Fact_Sheets/index.asp

Cookie Cutting
www.demonstrations.wolfram.com/CookieCutting

Evaluating a Hot Pizza
www.demonstrations.wolfram.com/EvaluateHotPizza

White, Jennifer et. al. *Math in the Garden*. National Garden Association. 2006.
ISBN: 978-0-915873-46-3
www.gardeningwithkids.org

Wooden Stand for Christmas Tree
www.demonstrations.wolfram.com/WoodenStandForAChristmasTree

Science

Chemistry (Topics listed alphabetically.)

Barber, Jacqueline. *Of Cabbages and Chemistry.* GEMS. 1999. ISBN: 0-924886-28-5
www.lhsgems.org/GEM195.html

Earth Science (Topics listed alphabetically.)

Dig It! The Secrets of Soil. Smithsonian Museum
www.forces.si.edu/soils

Soils Lessons and Resources, Natural Resources Conservation Service, U.S. Department of Agriculture
www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/resource

Topsoil Tour Kit. Carolina Biological.
www.carolina.com

Biology (Topics listed alphabetically.)

The Science of Cooking
www.exploratorium.edu/cooking/index.html

Teaching Biology to Middle School and High School Students. University of Pennsylvania-Developed Hands-On Activities
www.serendip.brynmawr.edu/sci_edu/waldron/#planteaters

Health (Topics listed alphabetically.)

Vitamin C Testing. Barber, Jacqueline ,GEMS. 1998. ISBN: 0-924886-31-5 (Also suitable for chemistry.)
www.lhsgems.org/GEM220.html

MyPlate. United States Department of Agriculture.
www.choosemyplate.gov

WebQuests

Missouri WebQuests (K-12 across a wide array of topics.)
www.mofb.org/WebQuest.aspx

Yogurt Parfait with Florida Fruit

Try This Florida Recipe

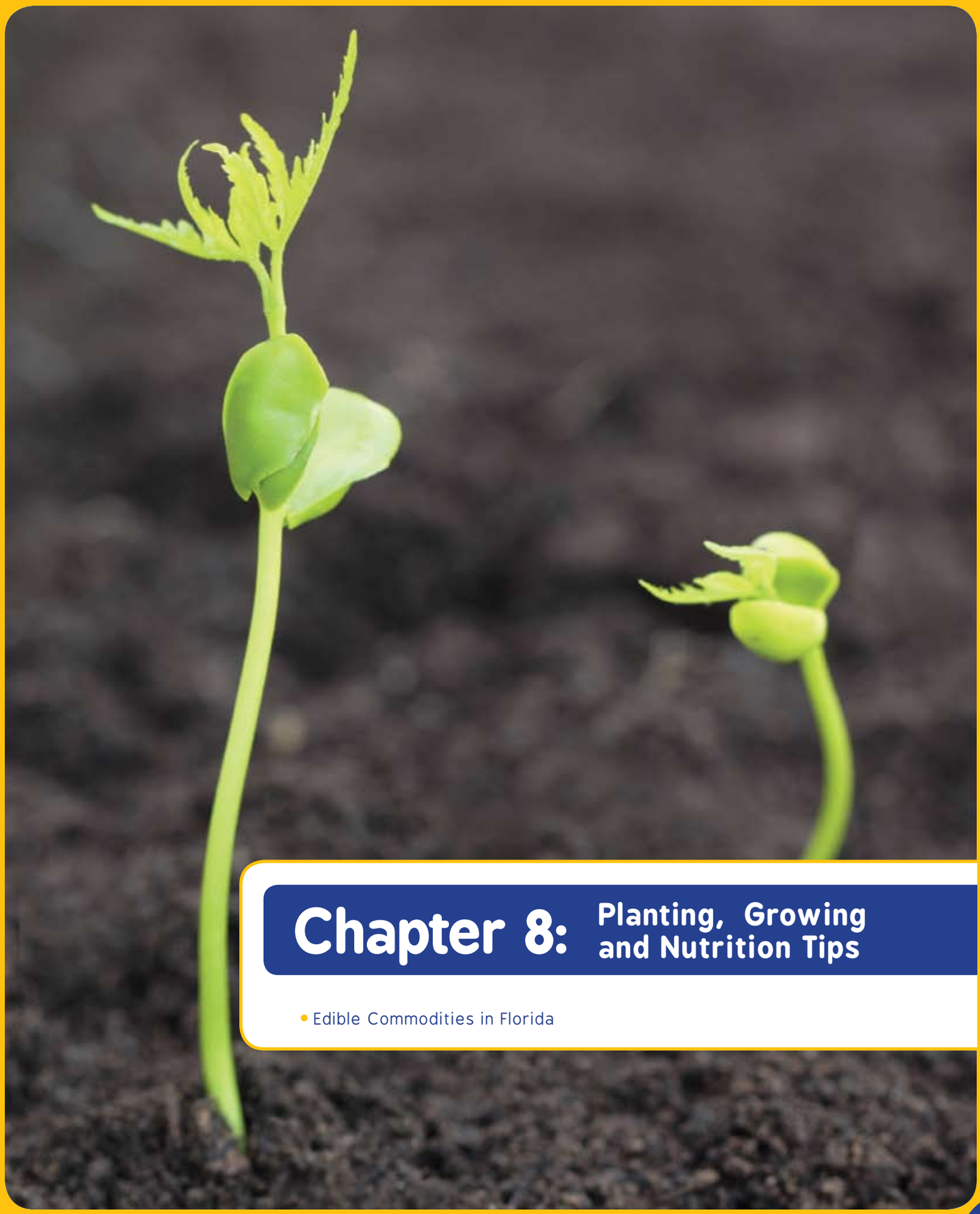
Ingredients

- 2 cups yogurt
- 2 cups Florida fruit of your choice
- 1/2 cup granola or mixed nuts and dried fruit

Instructions

- Wash your hands with soap and water, then gather all your kitchen gear and ingredients and put them on a clean counter.
- Put 1/4 cup yogurt in each glass and top with 1/4 cup fruit. Repeat once.
- Top each glass with 2 tablespoons granola and serve right away.

Fresh from Florida



Chapter 8: Planting, Growing and Nutrition Tips

- Edible Commodities in Florida

Edible Commodities in Florida: An Introduction

Florida farmers grow nearly 300 different crops to sell across the country. These crops are called commodities. Out of these crops, grapefruit, oranges, tangerines, snap beans, sugarcane, tomatoes, melons, cucumbers, squash, sweet corn and bell peppers made the most money in 2012, according to *2013 Florida Agriculture by the Numbers*. More than 9.25 million acres of Florida land is farmed, according to the 2013 guide. About 13,000 of those acres are being farmed organically, according to the Census of Agriculture 2012. Organic farms in Florida use natural fertilizer and pest control methods to keep their plants healthy. When studying economics or Florida history, it may be interesting to create a Commodity Garden at the school. Each region produces a variety of commodities such as:

South: Citrus, corn, beans, cucumbers, herbs, lettuce, peppers, squash, sugarcane, tomatoes, tropical fruit, watermelon

Central: Citrus, corn, blueberries, herbs, peaches, strawberries, tomatoes, watermelon

North: Blueberries, cabbage, corn, herbs, peaches, peanuts, potatoes

Refer to the individual planting guides in this section to determine how best to create your commodity garden. A helpful, comprehensive guide to vegetable gardening can be found in James M. Stephen's *Vegetable Gardening in Florida*.

Seed Sources

Southern Seed Exchange
Athens, GA

Tomato Growers Supply Company
Fort Myers, FL

Baker Creek Heirloom Seeds
www.rareseeds.com

Seeds of Change – Certified Organic
www.seedsofchange.com

Johnny's Selected Seeds
www.johnnyseeds.com

Burpee Seeds
www.burpee.com

What to Grow in Florida

Herbs

Overview
Herbs grown in pots, or in the ground, need well-drained soil and full sun to thrive. This means the soil in the pot should have plenty of sand, bark pieces and other matter to let the water drain quickly out of the soil.

Basil

What it is used for: A sweet herb. Leaves used in pizza sauce, pesto and other Italian cooking.
Days to sprout: Seven-to-10
Seed to plant: One month
Spacing: Six inches apart, or it can be grown hydroponically.

How do I harvest it? Basil is an annual plant, so once it flowers, it's finished. To keep it from "finishing," find the second bunch of leaves from the bottom of the plant, and snip off the entire stalk — this keeps the plant growing. Use the leaves in cooking. Flowers, when they appear, are edible, too.

Chives

What it is used for: Spicy flavor in fresh salads, and as a garnish
Days to sprout: Five-to-14
Seed to plant: Six weeks
Spacing: Eight-to-12 inches
How do I harvest it? Snip off at the base; the plant is a bulb and will grow back. Flowers are also edible. To spread to other pots, divide in half and replant any time of year.

Cilantro

What it is used for: Salsa, garnish
Days to sprout: 10-to-15
Seed to plant: Six weeks
Spacing: 12 inches
How do I harvest it? Cut off a few sprigs, or remove individual leaves as needed. Cilantro is an annual plant. Once the plant "bolts", or makes flowers, the flavor of the leaves changes and is not usually used anymore. Cilantro seeds are coriander, a spice commonly used in Indian cooking.

Dill

What it is used for: Garnish, salads
Days to sprout: 20-to-25 days
Seed to plant: Six weeks
Spacing: Three-to-12 inches
How do I harvest it? Cut off a few leaves at the base of plant, or cut the entire plant. Flowers, leaves and seeds are edible.

Fennel

What it is used for: Garnish, soups
Spacing: Three-to-five inches
How do I harvest it? Cut off a few leaves at the base of plant, or cut the entire plant. Flowers and leaves are edible.

Mint

Types: Chocolate mint, peppermint, spearmint, pineapple mint
What it is used for: Garnish, desserts, teas
Days to sprout: 10-to-16
Seed to plant: Six weeks
Spacing: 18 inches
How do I harvest it? Cut off a few stems at the base of plant. Flowers and leaves are edible.

Nasturtium

What it is used for: Edible flowers used as garnish or in salads.
Days to sprout: Seven-to-14
Seed to plant: Four-to-six weeks
Spacing: Six-to-12 inches
How do I harvest it? Pick off flowers where stem meets flower.

Oregano

What it is used for: In sauces for Italian cooking
Days to sprout: Eight-to-14 days
Seed to plant: Eight weeks
Spacing: Eight-to-12 inches
How do I harvest it? Take outer stems, with leaves, and cut from plant at base. Most gardeners dry this herb by hanging it upside down for a few weeks, then harvesting leaves. To pull leaves off, hold stem from tip and pull towards roots. Oregano is a perennial plant and will grow to fill whatever size pot you put it in.

Parsley

What it is used for: Garnish, salads
Days to sprout: 11-to-27
Seed to plant: Four-to-six weeks
Spacing: Six inches
How do I harvest it? Cut off a few sprigs, or remove individual leaves as needed. Parsley is an annual plant, meaning you'll plant new seeds every fall.

Rosemary

What it is used for: To flavor soups and stews, breads, meat dishes.
Days to sprout: Usually transplanted from plants.
Spacing: Six-to-24 inches
How do I harvest it? Cut off a few sprigs to the base of the stem, or remove individual leaves as needed. Most gardeners dry this herb by hanging it upside down for a few weeks, then harvesting leaves. To pull leaves off, hold stem from tip and pull toward roots. Rosemary is a perennial herb, and depending on the variety, can be kept in a well-drained pot for many years.

Sage

Varieties: Pineapple sage, silver-leafed sage
What it is used for: To flavor soups and stews, breads, meat dishes
Days to sprout: 14-to-21
Seed to plant: Four weeks
Spacing: 12 inches
How do I harvest it? Remove individual leaves as needed. Flowers are also edible. Pineapple sage is a butterfly attractant.

Thyme

Varieties: Lemon thyme, creeping thyme
What it is used for: To flavor soups and stews
Days to sprout: 20-30
Seed to plant: Eight weeks
Spacing: Six to12 inches
How do I harvest it? Cut off a few stems as needed; flowers are also edible. To pull leaves off, hold stem from tip and pull towards roots.

Beans

History and fun facts: Beans are originally from Central America.

Time of year to plant:
North: March – April
Central: February – April
South: September – April
Type of planting: Seeds
Florida-friendly varieties:
Bush beans – Bush Blue Lake, Contender
Pole beans – Dade, McCaslan, Kentucky Wonder, Blue Lake

Sun: At least six hours per day
Water: One cup per week, per plant
Nutrient needs: Beans benefit from monthly fertilizer applications of a standard 5-10-10 fertilizer, sprinkled into the soil at time of planting and again each month.

Planting tips: Beans can be planted directly into the ground, or in cups to transplant later. If planting in a garden, beans do well planted near tomatoes. Bush beans were developed for commercial growers that wanted all the beans ready at one time. Pole beans bear fruit longer.
Time from seedling to harvest: Eight weeks

How to harvest: Carefully clip bean from the stalk. Harvest when you can see the beans through the pods (and still green).

Nutritional value: Good source of vitamins C , K

Blueberries

History and fun facts: Florida farmers produce 20 million pounds of blueberries a year. Florida has some native varieties of blueberries that grow on the edges of wet pine forests, blanketed by pine needles. This is a clue that the natural environment for blueberries to thrive is in moist, acidic, nutrient-rich soils. Many home gardeners have trouble reproducing these conditions in their own yard as most of Florida's sandy soils are not naturally as acidic as blueberries prefer (4.0-5.5; see www.edis.ifas.ufl.edu for more specific growing information). It is advised to seek the volunteer expertise of a local blueberry grower to assist in planning your school blueberry garden.

Time of year to plant: Mid-December through mid-January
Type of planting: Seedlings
Florida-friendly varieties:
Northern counties: Rabbiteye (Vaccinium ashei)
Central and Southern counties to Sebring: Southern highbush
Sun: Needs at least six hours full sun per day.
Water: Likes moist soil
Nutrient needs: High, but specific — use a 12-4-8 fertilizer (Those formulated for azaleas would work well.)
Planting tips: Plant blueberries in mid-December through mid-January, and incorporate peat moss into planting area. Plant at least 20 feet from building foundation as this can make the soil even less acidic. Cover plants with three inches of pine bark mulch to provide acidic conditions. Once the soil is moist, fertilize lightly. Repeat every two months.

Time to harvest: Late April to June, depending on variety

How to harvest: Pick berries from stem.

Nutritional value: Good source of vitamins C, K and manganese

Cabbage

History and fun facts: The first cabbage was native to British Isles and Mediterranean Europe. Cabbage is also related to broccoli, cauliflower, collard greens, kale, Brussels sprouts and radishes. It contains many vitamins, including vitamin C.

Time of year to plant:
North: September–February
Central: September–January
South: September–January
Type of planting: Seedlings
Florida-friendly varieties: Bravo, Gourmet, King Cole

Sun: Needs at least six hours full sun per day
Water: Likes moist soil
Nutrient needs: High

Planting tips: Although some caterpillars will eat outer cabbage leaves, it is rarely serious enough to hurt the plant, and little insect control is needed. Be sure to maintain a regular watering and fertilization schedule.

Time from seedling to harvest: Three months

How to harvest: Cut bottom of cabbage off at the root when inner cabbage head is large enough (four-to-six inches wide); peel off outer leaves.

Nutritional value: Good source of vitamins C, K

Sweet Corn

History and fun facts: Corn is in the grass family. Corn was first grown for food in South and Central America, and is now a major food crop throughout the world. It is wind-pollinated, which means it needs ample space (at least 4 rows) to pollinate itself. Corn needs a lot of tender, loving care to grow and produce well and may not be suitable for amateur growers.

Time of year to plant:
North: March–April
Central: February–March
South: August–March
Type of planting: Seed, or transplants
Florida-friendly varieties: Silver Queen, Supersweet

Sun: At least six hours per day
Water: Maintain even soil moisture
Nutrient needs: High. Use lawn fertilizer at least once a month.

Planting tips: Corn needs at least 20 square feet of growing space for the rows of corn to cross-pollinate and form the ears of corn, or fruit, that we eat. Planting corn in a block is recommended.

Plant seedlings 15 inches apart. If growing from seed, plant a seed every two inches and thin to 15 inches when corn is several inches tall. Corn can be planted with pole beans (which use cornstalk as the pole), and grows well with potatoes and cucumbers.

Time from seedling to harvest: Eight-to-12 weeks

How to harvest: Harvest when juices in the seeds are halfway between clear and milky and tassels are brown.

Nutritional value: Good source of thiamin

Citrus

History and fun facts: A brief history of citrus production in Florida is included in the fruit garden chapter. It is important to note that citrus trees available for sale in plant nurseries have been grafted. One plant provides the root, and another plant provides the branches and fruit for the plant. The two have been combined together. Citrus trees are grown on sour citrus root stock, which makes them healthier and more disease resistant. For this reason, starting citrus plants from seed will not result in the same tree the fruit came from.

Time of year to plant:
North: Recommended to grow in containers so they can be moved inside during cold weather.
Central and South: Transplant nursery trees after the last frost (usually mid-late February)
Type of planting: Three gallon plant

Sun: At least six hours per day
Water: One inch of water per week
Nutrient needs: Citrus fertilizer should be applied every two months, March through September.

Planting tips: Dig a hole that's twice as wide, but no deeper than the rootball. Gently remove the tree from the container, and place in center of hole. Fill in with soil, build three-to-four inch berm of soil around edge of rootball, and then fill with water.
Time to harvest: Different varieties ripen at different times, but most ripen in December or January.

How to harvest: Citrus ripens on the tree, so leave it on the tree until it's needed. The acidity drops and sugars increase the longer it stays on the tree (for example, grapefruit is best when harvested in March.)When ready to harvest, hold the fruit and twist while pulling down.

Nutritional value: Good source of vitamins A, C (tangerine, grapefruit, orange)

Cucumbers

History and fun facts: Cucumbers originated in India, and are related to cantaloupe, summer squash, pumpkins and watermelons.

Time of year to plant:
North: February–April
Central: February–March
South: September–March
Type of planting: Seeds or plants
Florida-friendly varieties: Poinsett, Ashely, Dasher

Sun: At least six hours
Water: One inch per week
Nutrient needs: Fertilize once a month, using standard 5-10-10 formulation.
Planting tips: Plant seedlings 12 inches apart, and bury up to the first two leaves. Cucumbers grow well next to beans and corn.

Time from seedling to harvest: Six weeks for seeds; five weeks for plants.

How to harvest: Harvest when fruit is smooth and green (before they turn yellow). Cut from stem.

Lettuce

History and fun facts: Lettuce is in the Aster family, and is related to artichokes and dandelions. Lettuce is the world's most used salad crop. It originated in the eastern Mediterranean basin and was cultivated by the Egyptians as early as 4,500 years ago. Over time, people selectively cultivated the varieties that were less bitter, had less spines, less milky latex sap and less bitterness. There are four main forms — crisphead, butterhead, cos and loose leaf. Lettuce is a cool-season crop, and grows and tastes best when grown between 46 degrees and 75 degrees.

Time of year to plant:
North: February–March
Central: September–March
South: September–January
Type of planting: Seeds or transplants
Florida-friendly varieties:
Crisp: Floricrisp, Minetto, Ithatca, Fulton
Butterhead: Bibb, White Boston, Tom Thumb
Leaf: Simpson, Red Sails, Salad Bowl
Romaine: Parris Island Cos, Valmaine, Floricos

Sun: Four-to-six hours per day
Water: Keep soil evenly moist
Nutrient needs: Fertilize once a month with standard 5-10-10 fertilizer.

Planting tips: Lettuce seeds are sown in the first quarter inch of soil. To make a lettuce row, take the handle of a digging tool and lay it on the ground, pressing lightly. This will make a small furrow, in which to scatter the seeds. Tip the seed packet and let the seeds scatter from the corner of the packet along the row. Use the edges of the furrow to cover the seeds lightly, and water regularly until seeds sprout. When plants have first two leaves visible, pinch plants in between until plants are at recommended spacing. As lettuce matures, daytime temperatures will reach above 75 degrees and the lettuce will start to grow taller in the middle. This is called "bolting." As soon as the lettuce begins to put energy into bolting, and making a flowerhead, its leaves become bitter. Be sure to harvest the lettuce before it bolts, or let the lettuce go to seed to collect for next season.

Time from seed to harvest: Six-to-seven weeks for seeds, five-to-six weeks for seedlings

How to harvest: Take individual outer leaves off, or cut off entire plant. To save seed, allow lettuce to bolt up and form flowers. When seeds are fuzzy, pull the plant and hang it upside down in a paper bag to dry. When they're completely dry, rub them between your hands to separate seeds from chaff, and store in a cool, dry place.

Peanuts

History and fun facts: Florida farmers grow 200,000 acres of peanuts each year. Peanuts form underground. After the yellow flower is fertilized, it extends the ovary in the form of a 'peg', growing downward for about 10 days until the fertilized ovary is beneath the soil. The pods then form the shell and the nut that we recognize as a peanut.

Time of year to plant: May
Type of planting: Seed, two-to-four inches apart and in two-foot rows
Sun: Full sun
Water: Peanuts can be planted as school is finishing, and will not need irrigation until August. Do not water past September to keep fungal diseases down.
Nutrient needs: Peanuts grow well in sandy soil with minimal organic matter. As part of the pea family, they fix nitrogen from the air as a main source of fertilizer.

Planting tips: Peanuts must have loose, weed-free soil around them to form the pegs that penetrate the ground. Flowers will start to form a month after planting, and pegs form as the flowers are fertilized. It takes nine-to-10 weeks for the seeds (or peanuts) to mature once pegs reach the soil.

Harvesting tips: Peanuts are ready to be harvested when the leaves turn yellow. Remove entire plant with a pitchfork and shake off soil. Hang in a warm, dry place (like a garage) for one-to-two weeks, remove remaining soil, then cure for one-to-two weeks more.
Nutritional value: Good source of protein, niacin, folate, thiamin, vitamin E

Peppers

History and fun facts: Peppers are originally from Mexico and Central America. They are related to tomatoes, potatoes and eggplant.
Time of year to plant:
North: February–April
Central: January–March
South: August–March
Type of planting: Seedling
Florida-friendly varieties: Various, depending on type of pepper

Sun: Six hours
Water: Consistently moist soil
Nutrient needs: Fertilize monthly

Planting tips: Peppers need sulfur to set fruit. The first settlers of Florida dropped a few matchsticks in each hole before planting peppers to provide the nutrient. If first leaves turn yellow, apply sulfur in powdered form to the soil. Apply a two-inch layer of mulch after planting.

Time from seedling to harvest: 12 weeks

How to harvest: Cut the pepper from the plant using scissors or a knife, leaving one inch of stem on the fruit to help it keep longer.

Nutritional value: Good source of vitaimin C

Potatoes

History and fun facts: Potatoes originally came from Peru's mountainous regions. They are related to tomatoes, eggplant and peppers — the edible part is the tuber located below the ground. Americans eat 125 pounds of potatoes per person, per year. White potatoes need warm days and cool nights to flourish and are grown as a cool season crop. Sweet potatoes are warm season crops, but because they take at least four months to produce, they are not ideal for school gardens unless planted at the very start of the season.

Time of year to plant:
North: January–March
Central: January–February
South: September–January
Type of planting: From seed potato
Florida-friendly varieties: Sebago, Red Pontiac, Atlantic, Red LaSoda, LaRouge, Superior

Sun: Six hours
Water: Potatoes grow during the dry season in Florida, and may rot if too much water is applied. Keep soil moderately moist.

Nutrient needs: Apply a 5-10-10 fertilizer at planting, and again each month through the season.

Planting tips: Purchase seed potatoes from a local nursery. This will minimize disease in the new plants. Each small "eye" of a potato is a potential sprout. Use a paring knife to slice a one-inch section around each eye, and dip in wood ash to prevent disease. Plant four inches deep, spaced eight inches apart, in rows spaced at least three feet from each other. In 10 days, leaves should begin to sprout above the surface. When potatoes have grown about 10 inches, use a hoe to mound soil up around each stem, which will produce more potatoes.

Time from seedling to harvest: 12 weeks

How to harvest: Plant will turn yellow and die. Wait two weeks and then dig potatoes out of soil by digging below them, lifting the entire root mass out of the ground. This way, potatoes are not damaged in digging process.

Squash

History and fun facts: Squash originated in Mesoamerica, and was cultivated heavily by the North American indigenous tribes. Along with beans and corn, squash is the third of the "three sisters" that indigenous people often planted together Squash would shade out weeds while the bean grew on the cornstalk and shaded the plant.

Time of year to plant:

Cool	**Warm**
North: August	**North:** March–April
Central: August	**Central:** February–March
South: September	**South:** January–March

Type of planting: Seed or seedling
Florida-friendly varieties:
Cool: Sweet Mama, Table Queen, Butternut, Spaghetti
Warm: Summer crookneck, Dixie, Zucchini, Peter Pan

Sun: Six hours
Water: One inch per week. Keep leaves dry when watering
Nutrient needs: Apply fertilizer monthly

Planting tips: Train vines up vertical trellis for good production. To pollinate using a paint brush, transfer pollen from male flowers (bright yellow) to female flowers (green, with a small, swollen part at the stem).

Time from seedling to harvest: Eight weeks
How to harvest: Cut fruit stem to harvest. Harvest at six-to-nine inches.
Nutritional value: Good source of vitamins A, C

Strawberries

History and fun facts: Strawberries are in the Rose family, and are related to apples, peaches, plums, and nectarines. But strawberries are the only edible "vegetable" in this family, botanically speaking. They are marketed as a fruit. They are native to North and South America. The strawberry was originally named "strew-berry" because of its runners and berries that run along the ground (Jones, 2005). Honeybees pollinate strawberry plants.

Time of year to plant: October to November for all regions
Type of planting: Seedling
Florida-friendly varieties: Florida 90, Candler, Dover, Florida Belle, Oso Grande, Sweet Charlie, Selva

Sun: Six hours
Water: One inch per week, keeping water off leaves and fruit

Nutrient needs: Fertilize monthly
Planting tips: Directions for creating a strawberry tower are given in the *How to Plant a Fruit Garden for Small Spaces* in this book. Be sure to heavily mulch around plants to prevent fungal diseases.
Time from seedling to harvest: 12 weeks, then continuous through May

How to harvest: Pick berries from stems.
Nutritional value: Good source of vitamin C, manganese

Sugarcane

History and fun facts: Sugarcane is native to Asia, and has been grown in gardens for more than 4,000 years. It was the first staple crop brought by the Spanish to Florida in 1537.

In 1763, when Spain turned over Florida to the English, sugarcane production took off. Many of the English farmers converted old missions into sugarcane plantations. During the second Spanish occupation, settlers from different countries were encouraged to come and stake land, and many were interested in growing sugarcane.

In 1821, when Florida became a United States territory, the industry flourished. 'Canaveral' means cane fields. Loads of sugarcane was shipped north from ports in Cape Canaveral. By the late 1800s, canals were draining new land for sugarcane production south of Lake Okeechobee, and Florida's sugarcane industry continued to thrive.

Today, Florida produces more sugarcane than any other state, growing approximately 410,000 acres of the crop. While all areas of the state can grow sugarcane, it is produced commercially in the counties below Lake Okeechobee because of the rich, fertile soils of that area. One sugarcane stalk weighs an average of three pounds, and contains .3 pounds of raw, granular sugar.
Time of year to plant: August through January
Type of planting: Cuttings, or clones, from other plants

Florida-friendly varieties: Since the sugargrown in school gardens won't be made into crystallized sugar, 'chewing' varieties are recommended. These are: Yellow Gal; CP57-603; CP80-1837; CP80-1907; NG57-258 and White Transparent.

Sun: Full sun
Water: Moist soil
Nutrient needs: Needs rich, mucky soil with a lot of organic matter. Use an 8-8-8 fertilizer when planting sugarcane.

Planting tips: Plant sugarcane in furrows, or trenches, in rows approximately seven-to-eight inches deep and five feet apart. Loosely spread fertilizer in furrows. Cover with two inches of soil and plant canes.

Harvesting tips: Sugarcane is ready for harvest in late October, and before the first freeze. Caution: The blades of the grass are sharp. Use a knife to cut off stalk at base. The sugar is sweetest at the stalk. Also, remove top leaf blades, then slice for chewing.

Nutritional value: Carbohydrates (One teaspoon of granulated sugar cane contains 4 grams of carbohydrates) Carbohydrates are a source of energy for the brain and muscles. Use it in moderation. Sugar adds a boost of flavor to food, gives baked goods color and texture and acts as a preservative.

Tomatoes

History and fun facts: Tomatoes were originally grown in South America, Peru and Ecuador. Florida now grows 42 percent of America's tomato crop, more than any other state.

Time of year to plant:
North: February–April
Central: February–March
South: August–March
Type of planting: Seedlings
Florida-friendly varieties: Two types of tomato plants: determinant (will stop growing at a certain height), or indeterminant (will keep vining). When shopping for plants, keep in mind that hybrid plants offer improved disease resistance, but their seeds cannot be saved for planting next season.

Sun: Six hours per day
Water: One inch per week
Nutrient needs: Fertilize monthly

Planting tips: The Florida weave for planting indeterminant tomatoes: Hammer two, four-foot stakes at either end of the row. When tomato plants are four-to-six inches tall, run a string in between the stakes. At every tomato plant, run the string the opposite way around it from the last plant, directly under the nearest branch. This string will support the branch as it bears fruit. Then run a string the opposite way, forming a "figure 8" around each stem at the branch point. Repeat every four-to-six inches all the way up the stake as the plants continue to grow. Determinant cherry varieties perform well in containers. Pile up mulch around each plant to keep soil moist and leaves healthy. Keep soil evenly moist. Do not let it dry out. Blossom end rot happens when not enough calcium, or too little then too much water, is applied. Pinch off new leaves that grow in between the branch and the main stem to keep plant producing large fruit.

Time from seedling to harvest: 10 to 12 weeks

How to harvest: Pick tomato right before it ripens and allow it to ripen afterwards. To save seed from non-hybrid tomatoes, squeeze seeds and pulp into an open jar and add water. Leave uncovered for four days until white mold appears. Pour seeds and pulp into a strainer and wash with clean water, then put seeds on a paper towel to dry. Store in a cool, dry place.

Nutritional value: Good source of fiber, Vitamins A, C

Tropical Fruit

History and fun facts: The Southern region of Florida produces over 30 varieties of tropical fruit. Scientists began breeding tropical fruit trees and plants in the 1930s to create varieties suited to Florida's growing conditions. This research yielded many important results. Today, around 13,000 acres produce tropical fruit worth (www.edis.ifas.ufl.edu/document_ag210.) An interesting project within a classroom would be to assign students to interview their relatives and discover which fruit trees they remember from their childhood. A map of tropical fruit trees, and the regions they are from, could be compiled from this information. A complete list of growing instructions for tropical fruit can be found at www.edis.ifas.ufl.edu

Nutrient needs: Fertilize once in the fall and once in the spring with a 6-6-6 blend.
Nutritional value: Good source of vitamin C

Fruit	Type	Height	Region	Harvest Time
Banana	Perennial tree	12-15 feet	Central, South	Year-round
Blackberry	Perennial shrub	4-6 feet	North, Central, South	April-May
Carambola	Medium tree	25-35 feet	Central, South	June-October
Fig	Small tree	10-15 feet	North, Central, South	June-August
Lychee	Large tree	35-45 feet	South	June-July
Mango	Large tree	40-50 feet	Central, South	May-October
Papaya	Tree-like	15-20 feet	Central, South	Year-round
Pineapple	Perennial	2-3 feet	Central, South	Year-round

N – North C – Central S – South

Watermelon

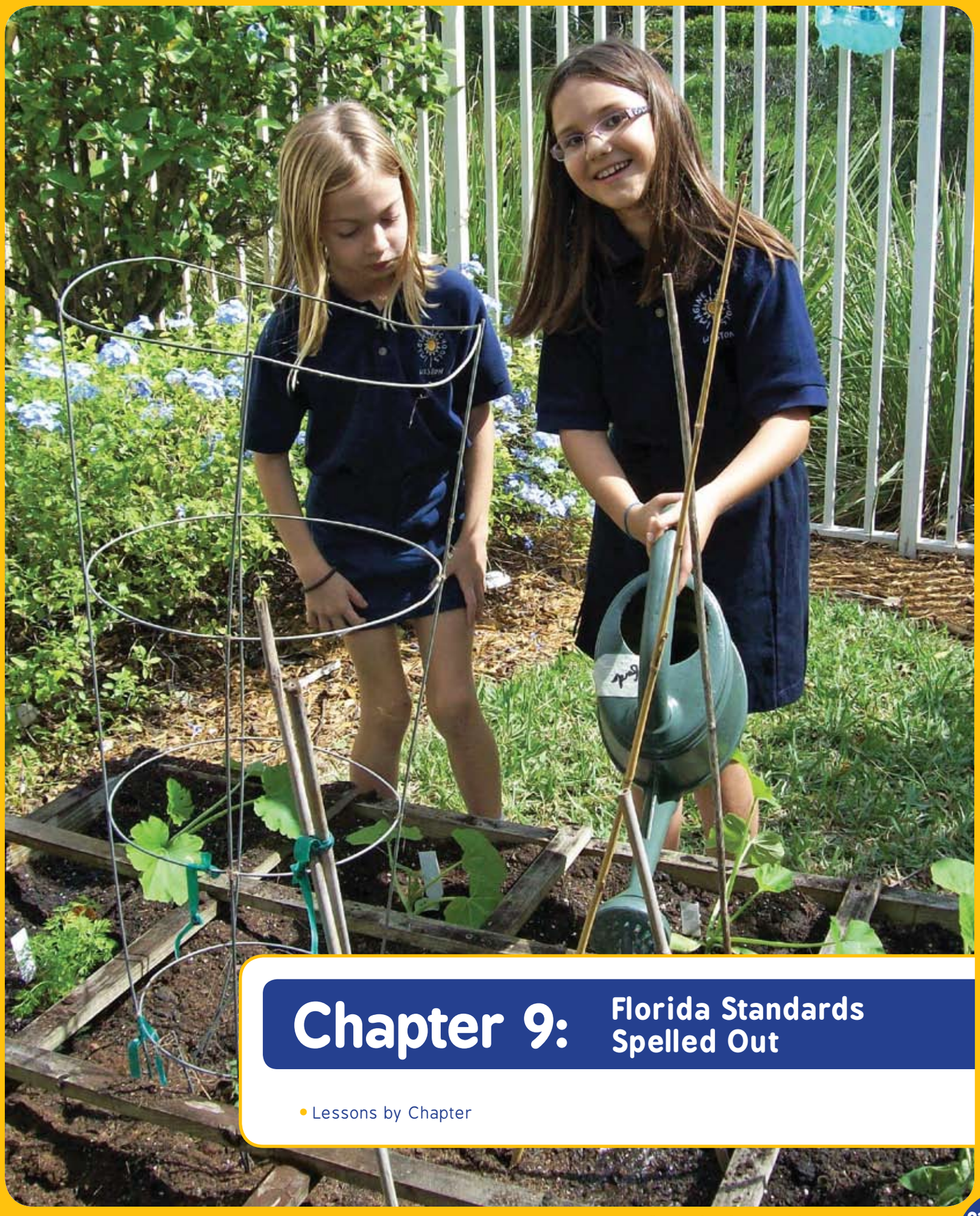
History and fun facts: Watermelon first came to the United States from Central Africa. Florida scientists began experimenting with fungus-resistant varieties in the 1930s and have developed some improved varieties since then.

Time of year to plant:
North: March – April
Central: January – March
South: January – March
Type of planting: Seed or seedling
Florida-friendly varieties: Large — Charleston Gray, Jubilee, Crimson Sweet, Dixielee. Small — Sugar Baby, Minilee, Mickylee. Seedless — Fummy

Sun: Six hours
Water: Likes moist soil, but is susceptible to fungal problems. Be sure to mulch heavily under the watermelon plants with coastal hay to keep fungal problems at bay, and water below leaves.
Nutrient needs: Fertilize monthly.

Planting tips: Seedlings should be planted 18 inches apart, buried up to the first leaves to establish a strong root structure. Watermelon is susceptible to a variety of fungal, bacterial and viral diseases. See this publication to diagnose a problem: www.edis.ifas.ufl.edu

Time from seedling to harvest: 11 to 13 weeks
How to harvest: Harvest when watermelon makes a "PLUNK!" sound when you hit it with a knuckle.
Nutritional value: Good source of vitamin C



Chapter 9: Florida Standards Spelled Out

- Lessons by Chapter

Florida Standards Spelled Out: Lessons by Chapter

Correlated using Florida Standards at *www.cpalms.org*.

Chapter 4: What We Eat - Part 1 - Page 50

National Next Generation Science:

K-LS1-a. Collect, analyze, and use data to describe patterns of what plants and animals (including humans) need to survive.

K-ESS3-a. Obtain information to describe the relationship between the needs of different plants and animals (including humans) and where they live on the land or in the water.

K-PS1-c. Ask questions, based on observations, to classify different objects by their use and to identify whether they occur naturally or are human-made.

1-LS1-a. Use diagrams and physical models to support the explanation of how the external parts of animals and plants help them survive, grow, and meet their needs.

2-LS2-a. Develop and use models to compare how living things depend on their surroundings to meet their needs in the places they live.

English Language Arts - Writing

LAFS.K.W.1.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.

LAFS.K.W.3.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).

LAFS.K.W.3.8. With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

LAFS.1.W.3.8. With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

LAFS.2.W.3.8. Recall information from experiences or gather information from provided sources to answer a question.

English Language Arts - Speaking and Listening

LAFS.K.SL.1.1 Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups.

LAFS.K.SL.1.2. Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.

LAFS.K.SL.1.3. Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

LAFS.K.SL.2.4. Describe familiar people, places, things, and events and, with prompting and support, provide additional detail.

LAFS.K.SL.2.5. Add drawings or other visual displays to descriptions as desired to provide additional detail.

LAFS.1.SL.1.2. Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

LAFS.1.SL.1.3. Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.

LAFS.1.SL.2.4. Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.

LAFS.1.SL.2.5. Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

LAFS.2.SL.1.2. Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

English Language Arts - Language: Conventions of Standard English

LAFS.K.L.3.5. With guidance and support from adults, explore word relationships and nuances in word meanings. Sort common objects into categories (e.g., shapes, foods) to gain a sense of the concepts the categories represent. Identify real-life connections between words and their use (e.g., note places at school that are colorful).

LAFS.K.L.3.6. Use words and phrases acquired through conversations, reading and being read to, and responding to texts

LAFS.1.L.3.5. With guidance and support from adults, demonstrate understanding of figurative language, word relationships and nuances in word meanings. Sort words into categories (e.g., colors, clothing) to gain a sense of the concepts the categories represent. Define words by category and by one or more key attributes (e.g., a duck is a bird that swims; a tiger is a large cat with stripes). Identify real-life connections between words and their use (e.g., note places at home that are cozy).

LAFS.1.L.3.6. Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using frequently occurring conjunctions to signal simple relationships (e.g., because).

Mathematics

MAFS.K.MD.2.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.

Social Studies

SS.K.E.1.4 Identify the difference between basic needs and wants.

Physical Education

PE.1.L.2.8 Name the food groups.

PE.1.R.1.3 Follow directions during a large group activity.

PE.2.L.2.11 Categorize food into food groups.

Science

SC.K.L.14.3 Observe plants and animals, describe how they are alike and how they are different in the way they look and in the things they do.

SC.1.L.14.2 Identify the major parts of plants, including stem, roots, leaves, and flowers.

SC.1.L.17.1 Through observation, recognize that all plants and animals, including humans, need the basic necessities of air, water, food, and space.

SC.2.L.16.1 Observe and describe major stages in the life cycles of plants and animals, including beans and butterflies.

SC.2.L.17.1 Compare and contrast the basic needs that all living things, including humans, have for survival.

My Garden, MyPlate - Page 59

National Next Generation Science

K-PS1-a. Design and conduct an investigation of different kinds of materials to describe their observable properties and classify the materials based on the patterns observed.

K-PS1-c. Ask questions, based on observations, to classify different objects by their use and to identify whether they occur naturally or are human-made.

2-LS2-a Develop and use models to compare how living things depend on their surroundings to meet their needs in the places they live.

English Language Arts - Writing

LAFS.K.W.1.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.

LAFS.K.W.3.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

LAFS.1.W.3.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

LAFS.2.W.3.8 Recall information from experiences or gather information from provided sources to answer a question.

English Language Arts - Speaking and Listening

LAFS.K.SL.1.2 Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.

LAFS.K.SL.1.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

LAFS.1.SL.1.2 Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

LAFS.1.SL.1.3 Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.

LAFS.2.SL.1.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

English Language Arts – Language: Conventions of Standard English

LAFS.K.L.3.5 With guidance and support from adults, explore word relationships and nuances in word meanings. Sort common objects into categories (e.g., shapes, foods) to gain a sense of the concepts the categories represent. Identify real-life connections between words and their use.

Physical Education

PE.K.L.2.6 Differentiate between healthy and unhealthy food choices.
PE.1.L.2.8 Name the food groups.
PE.1.R.1.3 Follow directions during a large group activity.
PE.2.L.2.11 Categorize food into food groups.

Health

HE.K.B.2 Demonstrate the ability to use interpersonal communication skills to enhance health and avoid or reduce health risks.
HE.K.B.3.2 Recognize healthy options to health-related issues or problems.
HE.K.P.1.1 Identify healthy practices and behaviors to maintain or improve personal health.
HE.K.P.2.1 Help others to make positive health choices.
HE.1.C.1.1 Identify healthy behaviors.
HE.1.P.1.1 Demonstrate good personal health habits.
HE.1.P.2.1 Encourage others to make positive health choices.
HE.2.C.1.1 Describe personal health.
HE.2.P.1. 1 Demonstrate the ability to practice advocacy, health-enhancing behaviors, and avoidance or reduction of health risks for oneself.

Science

SC.K.N.1.1 Collaborate with a partner to collect information.
SC.K.L.14.3 Observe plants and animals, describe how they are alike and how they are different in the way they look and in the things they do.
SC.K.P.8.1 Sort objects by observable properties, such as size, shape, color, temperature (hot or cold), weight (heavy or light) and texture.
SC.1.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration, and generate appropriate explanations based on those explorations.
SC.1.L.14.1 Make observations of living things and their environment using the five senses.
SC.1.P.8.1 Sort objects by observable properties, such as size, shape, color, temperature (hot or cold), weight (heavy or light), texture, and whether objects sink or float.
SC.2.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explorations.
SC.2.L.17.1 Compare and contrast the basic needs that all living things, including humans, have for survival.

Salad Rap- Part 1 - Page 63

National Next Generation Science

K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.
2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats.

English Language Arts – Writing

LAFS.K.W.1.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic
LAFS.K.W.3.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
LAFS.1.W.1.3 Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.
LAFS.1.W.3.8. With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
LAFS.2.W.1.3 Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.
LAFS.2.W.3.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).
LAFS.2.W.3.8 Recall information from experiences or gather information from provided sources to answer a question.

English Language Arts - Speaking and Listening

LAFS.K.SL.2.4 Describe familiar people, places, things, and events and, with prompting and support, provide additional detail.
LAFS.1.SL.1.2 Ask and answer questions about key details in a text read aloud or information presented orally or through other media.
LAFS.1.SL.2.4 Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.
LAFS.2.SL.1.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

English Language Arts – Language: Conventions of Standard English

LAFS.K.L.3.5 With guidance and support from adults, explore word relationships and nuances in word meanings. Sort common objects into categories (e.g., shapes, foods) to gain a sense of the concepts the categories represent. Identify real-life connections between words and their use (e.g., note places at school that are colorful). Distinguish shades of meaning among verbs describing the same general action (e.g., walk, march, strut, prance) by acting out the meanings.
LAFS.K.L.3.6 Use words and phrases acquired through conversations, reading and being read to, and responding to texts
LAFS.1.L.3.5 With guidance and support from adults, demonstrate understanding of figurative language, word relationships and nuances in word meanings. Sort words into categories (e.g., colors, clothing) to gain a sense of the concepts the categories represent. Identify real-life connections between words and their use (e.g., note places at home that are cozy). Distinguish shades of meaning among verbs differing in manner (e.g., look, peek, glance, stare, glare, scowl) and adjectives differing in intensity (e.g., large, gigantic) by defining or choosing them or by acting out the meanings.
LAFS.1.L.3.6 Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using frequently occurring conjunctions to signal simple relationships (e.g., because).

Social Studies

SS.K.E.1.4 Identify the difference between basic needs and wants.
SS.K.G.1.1 Describe the relative location of people, places, and things by using positional words.
SS.2.E.1.2 Recognize that people supply goods and services based on consumer demands.

Physical Education

PE.1.L.2.8 Name the food groups.
PE.2.L.2.11 Categorize food into food groups.

Vegetable Relay - Page 69

National Next Generation Science

1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats.
1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
K-LS1-a. Collect, analyze, and use data to describe patterns of what plants and animals (including humans) need to survive.

English Language Arts - Writing

LAFS.K.W.1.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.
LAFS.K.W.3.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).
LAFS.K.W.3.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
LAFS.1.W.3.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
LAFS.2.W.3.8 Recall information from experiences or gather information from provided sources to answer a question.

English Language Arts - Speaking and Listening

LAFS.K.SL.1.2 Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.

LAFS.K.SL.1.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

LAFS.1.SL.1.2 Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

LAFS.1.SL.1.3 Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.

LAFS.2.SL.1.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

English Language Arts - Conventions of Standard English

LAFS.K.L.3.5 With guidance and support from adults, explore word relationships and nuances in word meanings. Sort common objects into categories (e.g., shapes, foods) to gain a sense of the concepts the categories represent. Identify real-life connections between words and their use (e.g., note places at school that are colorful).

Mathematics

MAFS.K.MD.2.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.

Physical Education

PE.K.C.1.2 Recognize physical activities have safety rules and procedures

PE.K.L.1.4 Invite others to participate in physical activities with them.

PE.K.L.2.4 Participate in a variety of games that increase breathing and heart rate.

PE.K.L.2.6 Differentiate between healthy and unhealthy food choices.

PE.K.M.1.13 Move in a variety of ways in relation to others.

PE.K.R.1.1 Treat others with respect during play.

PE.1.C.1.2 Identify safety rules and procedures for selected physical activities

PE.1.L.2.8 Name the food groups.

PE.1.R.1.3 Follow directions during a large group activity.

PE.2.C.1.2 Understand safety rules and procedures for selected physical activities.

PE.2.L.2.11 Categorize food into food groups.

Health

HE.K.B.3.2 Recognize healthy options to health-related issues or problems.

HE.K.P.1.1 Identify healthy practices and behaviors to maintain or improve personal health.

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National Next Generation Science

3-LS1-a. Construct explanations from evidence that life cycles of plants and animals have similar features and predictable patterns.

4-LS1-a. Use simple models to describe that plants and animals have major internal and external structures, including organs that support survival, growth, behavior, and reproduction.

English Language Arts – Reading: Informational Text

LAFS.3.RI.2.4 Determine the meaning of a general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.

LAFS.4.RI.2.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.

LAFS.4.RI.4.10 By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 4–5 text complexity band proficiently, with scaffolding as needed at the high end of the range.

LAFS.5.RI.4.10 By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4–5 text complexity band independently and proficiently.

English Language Arts – Writing

LAFS.3.W.3.7 Conduct short research projects that build knowledge about a topic.

LAFS.3.W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

LAFS.4.W.3.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.

LAFS.4.W.3.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

LAFS.5.W.3.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

LAFS.5.W.3.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

Physical Education

PE.3.L.2.5 Identify ways that technology can assist in the pursuit of physical fitness.

Health

HE.3.B.1.4 Identify a variety of technologies to gather health information.

HE.3.B.4.2 Examine resources that could assist in achieving a small group personal health goal.

HE.4.B.1.4 Compare a variety of technologies to gather health information.

HE.5.B.1.4 Demonstrate the use of a variety of technologies to gather health information.

Science

SC.3.N.1.1 Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

SC.3.P.8.3 Compare materials and objects according to properties such as size, shape, color, texture, and hardness.

SC.4.N.1.1 Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

SC.4.L.17.2 Explain that animals, including humans, cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them.

SC.5.L.14.2 Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support -- some with internal skeletons others with exoskeletons -- while some plants have stems for support.

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National Next Generation Science

3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

English Language Arts – Reading: Informational Text

LAFS.3.RI.1.3. Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

LAFS.3.RI.4.10
LAFS.4.RI.4.10
LAFS.5.RI.4.10 By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 2–3 text complexity band independently and proficiently.

LAFS.4.RI.1.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

LAFS.4.RI.2.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.

LAFS.5.RI.1.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

LAFS.5.RI.1.3 Explain the relationships or interactions between two or more individuals, FSents, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

LAFS.5.RI.3.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

LAFS.5.RI.3.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

English Language Arts – Writing

LAFS.3.W.3.7	
LAFS.4.W.3.7	
LAFS.5.W.3.7	Conduct short research projects that build knowledge about a topic.
LAFS.3.W.3.8	Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
LAFS.4.W.3.8	Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
LAFS.4.W.3.9	
LAFS.5.W.3.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LAFS.5.W.3.8	Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

English Language Arts Speaking and Listening

LAFS.3.SL.2.4	Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.
LAFS.4.SL.2.4	Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.
LAFS.5.SL.1.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly. Come to discussions prepared having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion. Follow agreed-upon rules for discussions and carry out assigned roles. Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.
LAFS.5.SL.1.2	Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
LAFS.5.SL.2.4	Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

English Language Arts – Language: Conventions of Standard English

LAFS.3.L.3.6	
LAFS.4.L.3.6	
LAFS.5.L.3.6	Acquire and use accurately grade-appropriate conversational, general academic, and domain-specific words and phrases, including those that signal spatial and temporal relationships.

Health

HE.4.B.3.5	Choose a healthy option when making decisions for yourself and/or others.
HE.4.C.1.1	Identify the relationship between healthy behaviors and personal health.
HE.5.B.4.1	Specify a personal health goal and track progress toward achievement.
HE.5.C.1.1	Describe the relationship between healthy behaviors and personal health.

Science

SC.3.N.1.1	Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
SC.3.L.17.1	Describe how animals and plants respond to changing seasons.
SC.3.L.17.2	Recognize that plants use energy from the Sun, air, and water to make their own food.
SC.4.N.1.1	Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
SC.4.N.1.2	Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups.
SC.4.L.16.4	Compare and contrast the major stages in the life cycles of Florida plants and animals, such as those that undergo incomplete and complete metamorphosis, and flowering and nonflowering seed-bearing plants.
SC.4.L.17.2	Explain that animals, including humans, cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them.
SC.5.L.14.2	Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support -- some with internal skeletons others with exoskeletons -- while some plants have stems for support.

Garden Art - Page 107

Art Education

VA.3.C.1.1	Use the art-making process to develop ideas for self-expression.
VA.3.C.1.2	Reflect on and interpret works of art, using observation skills, prior knowledge, and experience.
VA.3.C.2.2	Compare techniques used by peers and established artists as a basis for improving one's own work.
VA.3.C.3.2	Describe the connections between visual art and other contexts through observation and art criticism.
VA.3.F.1.1	Manipulate art media and incorporate a variety of subject matter to create imaginative artwork.
VA.3.F.2.1	Identify places where artists or designers have made an impact on the community.
VA.3.F.3.2	Collaborate to complete a task in art.
VA.3.F.3.3	Demonstrate the skills needed to complete artwork in a timely manner, demonstrating perseverance and development of 21st-century skills.
VA.3.H.1.1	Describe cultural similarities and differences in works of art.
VA.3.H.2.2	Examine artworks and utilitarian objects, and describe their significance in the school and/or community.
VA.3.O.2.1	Use creative and innovative ideas to complete personal artworks.
VA.3.S.1.1	Manipulate tools and media to enhance communication in personal artworks.
VA.3.S.1.2	Use diverse resources to inspire artistic expression and achieve varied results.
VA.3.S.1.3	Incorporate ideas from art exemplars for specified time periods and cultures.
VA.3.S.2.2	Follow procedures, focusing on the art-making process.
VA.3.S.3.1	Use materials, tools, and processes to achieve an intended result in two- and/or three-dimensional artworks.
VA.3.S.3.3	Work within safety guidelines while using tools, media, techniques, and processes.
VA.4.C.1.1	Integrate ideas during the art-making process to convey meaning in personal works of art.
VA.4.C.1.2	Describe observations and apply prior knowledge to interpret visual information and reflect on works of art.
VA.4.C.2.2	Use various resources to generate ideas for growth in personal works.
VA.4.C.2.3	Develop and support ideas from various resources to create unique artworks.
VA.4.F.1.1	Combine art media with innovative ideas and techniques to create two- and/or three-dimensional works of art.
VA.4.F.2.2	Identify the work of local artists to become familiar with art-making careers.
VA.4.H.1.3	Describe artworks that honor and are reflective of particular individuals, groups, events, and/or cultures.
VA.4.H.2.1	Explore works of art, created over time, to identify the use of the structural elements of art in an historical event or art style.
VA.4.S.1.1	Manipulate tools and materials to achieve diverse effects in personal works of art.
VA.4.S.3.1	Experiment with various materials, tools, techniques, and processes to achieve a variety of results in two- and/or three-dimensional artworks.
VA.4.S.3.2	Plan and produce art through ongoing practice of skills and techniques.
VA.4.S.3.3	Follow procedures for using tools, media, techniques, and processes safely and responsibly.
VA.5.C.1.1	Develop a range of interests in the art-making process to influence personal decision-making.
VA.5.C.1.2	Use prior knowledge and observation skills to reflect on, analyze, and interpret exemplary works of art.
VA.5.C.1.3	Examine and discuss exemplary works of art to distinguish which qualities may be used to evaluate personal works.
VA.5.C.2.2	Analyze personal artworks to articulate the motivations and intentions in creating personal works of art.
VA.5.F.1.1	Examine and experiment with traditional or non-traditional uses of media to apply imaginative techniques in two- and/or three-dimensional artworks.
VA.5.F.2.3	Discuss contributions that artists make to society.
VA.5.F.3.2	Create artwork that shows procedural and analytical thinking to communicate ideas.
VA.5.F.3.4	Follow directions and complete artwork in the timeframe allotted to show development of 21st-century skills.
VA.5.H.1.2	Use suitable behavior as a member of an art audience.
VA.5.H.2.1	Compare works of art on the basis of style, culture, or artist across time to identify visual differences.
VA.5.O.2.1	Analyze works of art that document people and events from a variety of places and times to synthesize ideas for creating artwork.

VA.5.S.1.1 Use various art tools, media, and techniques to discover how different choices change the effect on the meaning of an artwork.
VA.5.S.1.3 Create artworks to depict personal, cultural, and/or historical themes.
VA.5.S.2.2 Identify sequential procedures to engage in art production.
VA.5.S.2.3 Visualize the end product to justify artistic choices of tools, techniques, and processes.
VA.5.S.3.1 Use materials, tools, techniques, and processes to achieve expected results in two- and/or three-dimensional artworks.
VA.5.S.3.3 Use tools, media, techniques, and processes in a safe and responsible manner.

English Language Arts – Writing

LAFS.3.W.1.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
LAFS.3.W.1.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.
LAFS.4.W.1.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
LAFS.4.W.1.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.
LAFS.4.W.2.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
LAFS.5.W.1.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
LAFS.5.W.1.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

English Language Arts – Language: Conventions of Standard English

LAFS.3.L.3.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain-specific words and phrases, including those that signal spatial and temporal relationships.
LAFS.4.L.3.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal precise actions, emotions, or states of being (e.g., quizzed, whined, stammered) and that are basic to a particular topic.
LAFS.5.L.3.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal contrast, addition, and other logical relationships.

Health

HE.4.B.3.3 Itemize healthy options to health-related issues or problems.
HE.4.C.1.1 Identify the relationship between healthy behaviors and personal health.
HE.5.C.1.1 Describe the relationship between healthy behaviors and personal health.

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English Language Arts - Writing

LAFS.3.W.1.2
LAFS.4.W.1.2
LAFS.5.W.1.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
LAFS.3.W.3.7 Conduct short research projects that build knowledge about a topic.
LAFS.3W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
LAFS.4.W.3.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
LAFS.4.W.3.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
LAFS.5.W.3.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.
LAFS.5.W.3.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

Mathmatics

MAFS.4.MD.1.1 Know relative sizes of measurement units within one system of unit including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...

Physical Education

PE.3.L.2.12 Read food labels for specific nutrition facts.
PE.4.L.2.13 Understand appropriate serving size.
PE.5.L.2.12 Plan a menu for a balanced meal.

Health

HE.3.B.1.4 Identify a variety of technologies to gather health information.
HE.3.B.4.2 Examine resources that could assist in achieving a small group personal health goal.
HE.4.C.1.1 Identify the relationship between healthy behaviors and personal health.
HE.5.B.1.4 Demonstrate the use of a variety of technologies to gather health information.
HE.5.B.4.2 Select reliable resources that would assist in achieving a small group personal health goal.
HE.5.C.1.1 Describe the relationship between healthy behaviors and personal health.

My Meal Choices - Page 123

National Next Generation Science

5-LS2-a. Construct and use models of food webs to describe the transfer of matter among plants, animals, decomposers, and the environment and discuss limitations of these models.
5-PS3-a. Use models to describe that energy animals use to maintain body warmth, body repair, and for motion was once energy from the sun.
5-LS2-d. Ask questions about what organisms obtain from the environment and what they release as waste matter back into the environment.

English Language Arts - Reading: Informational Text

LAFS.4.RI.2.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.
LAFS.4.RI.4.10 By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 4–5 text complexity band proficiently, with scaffolding as needed at the high end of the range.
LAFS.5.RI.4.10 By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4–5 text complexity band independently and proficiently.

English Language Arts - Writing

LAFS.3.W.1.2
LAFS.4.W.1.2
LAFS.5.W.1.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
LAFS.3.W.3.7 Conduct short research projects that build knowledge about a topic.
LAFS.3.W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
LAFS.4.W.3.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
LAFS.4.W.3.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
LAFS.5.W.3.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.
LAFS.5.W.3.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

Health

HE.3.C.1.1 Describe healthy behaviors that affect personal health.
HE.4.B.4.1 Identify the relationship between healthy behaviors and personal health.
HE.4.B.3.5 Choose a healthy option when making decisions for yourself and/or others.
HE.4.C.1.1 Identify the relationship between healthy behaviors and personal health.
HE.5.B.3.5 Select a healthy option when making decisions for yourself and/or others.
HE.5.C.1.1 Describe the relationship between healthy behaviors and personal health.

Physical Education

PE.3.L.2.5 Identify ways that technology can assist in the pursuit of physical fitness.
PE.4.L.2.12 Develop short and long-term fitness goals.
PE.4.L.2.13 Understand appropriate serving size.
PE.5.L.2.12 Plan a menu for a balanced meal.

Science

SC.3.L.14.1 Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction.

SC.3.L.17.2 Recognize that plants use energy from the Sun, air, and water to make their own food.

SC.3.N.3.2 Recognize that scientists use models to help understand and explain how things work.

SC.4.L.17.2 Explain that animals, including humans, cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them.

SC.4.L.17.3 Trace the flow of energy from the Sun as it is transferred along the food chain through the producers to the consumers.

Nutrient Tally - Page 132

English Language Arts - Reading: Informational Text

LAFS.4.RI.2.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.

LAFS.4.RI.4.10 By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 4–5 text complexity band proficiently, with scaffolding as needed at the high end of the range.

LAFS.5.RI.5.10 By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4–5 text complexity band independently and proficiently.

English Language Arts - Writing

LAFS.3.W.1.2
LAFS.4.W.1.2
LAFS.5.W.1.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

LAFS.3.W.3.7 Conduct short research projects that build knowledge about a topic.

LAFS.3.W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

LAFS.4.W.3.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.

LAFS.4.W.3.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

LAFS.5.W.3.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

LAFS.5.W.3.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

Mathematics

MAFS.3.MD.2.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.

Physical Education

PE.3.L.2.5 Identify ways that technology can assist in the pursuit of physical fitness.

Health

HE.3.B.1.4 Identify a variety of technologies to gather health information.

HE.3.B.4.2 Examine resources that could assist in achieving a small group personal health goal.

HE.4.B.1.4 Compare a variety of technologies to gather health information.

HE.4.C.1.1 Identify the relationship between healthy behaviors and personal health.

HE.5.B.1.4 Demonstrate the use of a variety of technologies to gather health information.

HE.5.B.4.2 Select reliable resources that would assist in achieving a small group personal health goal.

HE.5.C.1.1 Describe the relationship between healthy behaviors and personal health.

What We Eat - Part 2 - Page 143

National Next Generation Science

MS-LS1-j. Base explanations on evidence obtained from sources for the role of photosynthesis in the cycling of matter and flow of energy on Earth.

MS-LS2-f. Develop and use a model to support explanations about the transfer of matter and energy into and out of ecosystems and among organisms.

MS-LS2-b. Ask questions to clarify the premise of the argument that organisms within different ecosystems obtain matter and energy in similar ways.

HS-ESS3-a. Construct explanations based on evidence for how the development of human societies has been influenced by natural resource availability.

English Language Arts - Writing

LAFS.3.W.3.7
LAFS.4.W.3.7
LAFS.5.W.3.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

LAFS.3.W.3.8
LAFS.4.W.3.8
LAFS.5.W.3.8. Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

Writing Standards for Literacy in History/Social Studies, Science and Technical Subjects

LAFS.68.WHST.2.4
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.68.WHST.3.7
Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

LAFS.68.WHST.3.8
Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

LAFS.68.WHST.3.9
Draw evidence from informational texts to support analysis reflection, and research.

English Language Arts - Speaking and Listening

LAFS.3.SL.2.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

LAFS.4.SL.1.2 Paraphrase portions of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

LAFS.4.SL.2.4 Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

LAFS.5.SL.1.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.
Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
Follow agreed-upon rules for discussions and carry out assigned roles.
Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.

LAFS.5.SL.1.2 Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

LAFS.5.SL.2.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

LAFS.6.SL.1.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.
Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.
Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.
Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.

Salad Rap- Part 2 - Page 154

National Next Generation Science

5-PS1-3 Make observations and measurements to identify materials based on their properties.

5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

English Language Arts – Writing

LAFS.3.W.1.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

LAFS.3.W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

LAFS.4.W.1.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

LAFS.4.W.3.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.

LAFS.4.W.3.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

LAFS.5.W.1.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

English Language Arts - Speaking and Listening

LAFS.5.SL.1.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

Physical Education

PE.4.L.2.13 Understand appropriate serving size.

Chapter 6: Energy In/Energy Out - Page 162

National Next Generation Science

MS-PS3-f. Develop models to represent that plants produce sugars by reacting carbon dioxide and water and absorbing energy, and that the opposite process occurs in plants and animals to release energy. (Disciplinary Core Ideas PS3.D)

MS-LS2-f. Develop and use a model to support explanations about the transfer of matter and energy into and out of ecosystems and among organisms.

MS-LS1-k. Develop a model to support the explanation that within an individual organism, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules to support growth, or to release energy.

HS-LS1-a. Critically read scientific literature and produce scientific writing and/or oral presentations that communicate how the structure and function of systems of specialized cells within organisms help perform the essential functions of life.

HS-LS2-e. Apply scientific knowledge and evidence to explain that elements and energy are conserved as matter cycles and energy flows through ecosystems.

English Language Arts - Writing

LAFS.6.W.3.7
LAFS.7.W.3.7
LAFS.8.W.3.7
LAFS.910.W.3.7
LAFS.1112.W.3.7

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.6.W.3.9
LAFS.7.W.3.9
LAFS.8.W.3.9
LAFS.910.W.3.9
LAFS.1112.W.3.9

Draw evidence from literary or informational texts to support analysis, reflection, and research.

English Language Arts - Conventions of Standard English

LAFS.6.L.3.6
LAFS.7.L.3.6
LAFS.8.L.3.6
LAFS.910.L3.6
LAFS.1112.L.3.6

Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Reading Standards fo Literacy in Science and Technical Subjects 6-12

LAFS.68.RST.2.4
LAFS.910.RST.2.4
LAFS.1112.RST.2.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades level texts and topics.

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects

LAFS.68.WHST.3.7
LAFS.910.WHST.3.7
LAFS.1112.WHST.3.7

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

LAFS.68.WHST.3.9
LAFS.910.WHST.3.9
LAFS.1112.WHST.3.9

Draw evidence from informational texts to support analysis reflection, and research.

Mathematics

MAFS.6.NS.1.1

Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

MAFS.6.NS.2.3

Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

MAFS.6.EE.1.1

Write and evaluate numerical expressions involving whole-number exponents.

MAFS.6.EE.1.2.B

Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.

MAFS.6.EE.2.5

Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

MAFS.7.NS.1.1

Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

MAFS.7.NS.1.2

Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

MAFS.7.NS.1.2.C

Apply properties of operations as strategies to multiply and divide rational numbers.

Physical Education

PE.6.C.1.1 Identify at least two movements or activities which lead to improvement in each of the health-related components of fitness.

PE.6.L.2.3 Use a variety of resources including available technology to assess, design, and evaluate their personal physical activity plan

PE.6.R.2.2 Recognize the potential benefits of participation in a variety of physical activities.

PE.912.C.1.13 Document food intake, calories consumed, and energy expended through physical activity and analyze the results.

Health

HE.6.B.1.1 Examine the validity of health information, products, and services.

HE.6.B.1.2 Describe valid health information from home, school, and community.

HE.6.B.1.3 Examine the accessibility of products and services that enhance health.

HE.6.B.1.5 Determine valid and reliable health products and services.

HE.6.B.1.6 Determine the cost of health products and services in order to assess value.

HE.7.B.1.1 Analyze the validity of health information, products, and services.

HE.7.B.1.2 Access valid health information from home, school, and community.
HE.7.B.1.3 Determine the accessibility of products and services that enhance health.
HE.7.B.1.5 Access valid and reliable health products and services.
HE.7.B.1.6 Compute the cost of health products and services in order to assess value.
HE.8.B.1.1 Evaluate the validity of health information, products, and services.
HE.8.B.1.2 Analyze valid health information from home, school, and community.
HE.8.B.1.3 Analyze the accessibility of products and services that enhance health.
HE.8.B.1.6 Compare the cost of health products and services in order to assess value.
HE.8.B.3.4 Categorize healthy and unhealthy alternatives to health-related issues or problems.
HE.8.B.4.1 Assess personal health practices.
HE.8.P.1.3 Propose a variety of behaviors that avoid or reduce health risks.
HE.912.B.1.1 Verify the validity of health information, products, and services.
HE.912.B.1.2 Compile data reflecting the accessibility of resources from home, school, and community that provide valid health information.
HE.912.B.1.3 Evaluate the accessibility of products and services that enhance health.
HE.912.B.3.6 Employ the healthiest choice when considering all factors in making a decision.
HE.912.P.1.2 Demonstrate a variety of healthy practices and behaviors that will maintain or improve health.

Science

SC.6.L.14.3 Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.
SC.7.L.17.1 Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.
SC.8.L.18.1 Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.
SC.912.L.18.7 Identify the reactants, products, and basic functions of photosynthesis.

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National Next Generation Science

MS-ESS3-c. Construct and use oral and written arguments supported by empirical evidence to balance competing demands for various human uses of fresh water and biosphere resources.
HS-ESS3-b. Analyze and revise solutions for developing, managing, and utilizing resources that would increase economic, social, environmental, and/or cost: benefit ratios.

English Language Arts - Writing

LAFS.68.W.3.7
LAFS.910.W.3.7
LAFS.1112.W.3.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LAFS.68.W.3.9
LAFS.910.W.3.9
LAFS.1112.W.3.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

English Language Arts - Conventions of Standard English

LAFS.68.L.3.6
LAFS.910.L.3.6
LAFS.1112.L.3.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Reading Standards for Literacy in Science and Technical Subjects 6-12

LAFS.68.RST.2.4
LAFS.910.RST.2.4
LAFS.1112.RST.2.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6–8 texts and topics.*
(grades 9–10 texts and topics.)
(grades 11–12 texts and topics.)

Writing Standards for Literacy in History/Social Studies, Science and Technical Subjects

LAFS.68.WHST.2.4
LAFS.910.WHST.2.4
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LAFS.68.WHST.3.7
LAFS.910.WHST.3.7
LAFS.1112.WHST.3.7
Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
LAFS.68.WHST.3.9
LAFS.910.WHST.3.9
LAFS.1112.WHST.3.9
Draw evidence from informational texts to support analysis reflection, and research.

Social Studies

SS.8.G.5.1 Describe human dependence on the physical environment and natural resources to satisfy basic needs in local environments in the United States.

Physical Education

PE.6.C.1.8 Prepare a log noting the food intake, calories consumed, and energy expended through physical activity and describe results.
PE.912.C.1.13 Document food intake, calories consumed, and energy expended through physical activity and analyze the results.

Health

HE.6.B.1.7
HE.7.B.1.7 Investigate a variety of technologies to gather health information.
HE.6.B.3.1
HE.7.B.3.1 Investigate health-related situations that require the application of a thoughtful decision-making process.
HE.6.B.3.5
HE.7.B.3.5 Specify the potential outcomes of each option when making a health-related decision.
HE.6.B.3.6 Choose healthy alternatives over unhealthy alternatives when making a decision.
HE.6.B.3.7 Assess the outcomes of a health-related decision.
HE.6.B.4.2
HE.7.B.4.2 Develop an individual goal to adopt, maintain, or improve a personal health practice.
HE.6.B.4.3 Determine strategies and skills needed to attain a personal health goal.
HE.6.C.2.6 Propose ways that technology can influence peer and community health behaviors.
HE.7.C.2.6 Evaluate the influence of technology in locating valid health information.
HE.912.P.2.1 Utilize current, accurate data/information to formulate a health-enhancing message.

Science

SC.6L.14.3 Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.

In Search of Essential Nutrients - Page 173

National Next Generation Science

5-LS2-d. Ask questions about what organisms obtain from the environment and what they release as waste matter back into the environment.
5-ESS2-a. Use models to describe interactions between the geosphere, hydrosphere, atmosphere, and biosphere and identify the limitations of the models.
MS-PS1-f. Gather and communicate information that people's needs and desires for new materials drive chemistry forward, and that synthetic materials come from natural resources and impact society.
MS-LS2-e. Conduct an investigation of the cycling of matter among living and non-living parts of ecosystems to support the explanation of the flow of energy and conservation of matter.
MS-LS2-f. Develop and use a model to support explanations about the transfer of matter and energy into and out of ecosystems and among organisms.
MS-LS2-a. Use a model to support explanations of the effect of resource availability on organisms and populations of organisms in an ecosystem.

MS-ESS3-c. Construct and use oral and written arguments supported by empirical evidence to balance competing demands for various human uses of fresh water and biosphere resources.
HS-LS2-e. Apply scientific knowledge and evidence to explain that elements and energy are conserved as matter cycles and energy flows through ecosystems.
HS-LS2-f. Ask questions to define a problem caused by changes in population, resources, and/or the environment that can be solved through environmental engineering of solutions specific to the competition of organisms for matter and energy.
HS-ESS3-a. Construct explanations based on evidence for how the development of human societies has been influenced by natural resource availability.
HS-ESS3-b. Analyze and revise solutions for developing, managing, and utilizing resources that would increase economic, social, environmental, and/or cost: benefit ratios.
HS-ESS3-i. Use models of Earth system interactions to support explanations of the relationships among the hydrosphere, atmosphere, cryosphere, geosphere, and biosphere systems and how they are being modified in response to human activities.

English Language Arts - Reading: Informational Text

LAFS.5.RI.1.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
LAFS.5.RI.1.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

English Language Arts - Writing

LAFS.68.W.3.9
LAFS.910.W.3.9
LAFS.1112.W.3.9 Draw evidence from informational texts to support analysis, reflection, and research.

Writing Standards for Literacy in History/Social Studies, Science and Technical Subjects

LAFS.68.WHST.1.2
LAFS.910.WHST.1.2
LAFS.1112.WHST.1.2
Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
LAFS.68.WHST.2.4
LAFS.910.WHST.2.4
LAFS.1112.WHST.2.4
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LAFS.68.WHST.3.7
LAFS.910.WHST.3.7
LAFS.1112.WHST.3.7
Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

English Language Arts - Language

LAFS.68.L.3.6
LAFS.910.L.3.6
LAFS.1112.L.3.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Reading Standards for Literacy in Science and Technical Subjects 6-12

LAFS.68.RST.1.1
Cite specific textual evidence to support analysis of science and technical texts.
LAFS.68.RST.2.4
LAFS.910.RST.2.4
LAFS.1112.RST.2.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6–8 texts and topics*.
(grades 9–10 texts and topics.)
(grades 11–12 texts and topics.)
LAFS.68.RST.3.7
Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Social Studies

SS.8.G.5.1 Describe human dependence on the physical environment and natural resources to satisfy basic needs in local environments in the United States.

Health

HE.7.C.2.6 Evaluate the influence of technology in locating valid health information.
HE.912.P.2.1 Utilize current, accurate data/information to formulate a health-enhancing message.

Science

SC.5.L.17.1 Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.
SC.6.L.14.3 Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.
SC.7.L.17.1 Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.
SC.7.L.17.3 Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.
SC.8.L.18.1 Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.
SC.8.L.18.3 Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.
SC.912.L.14.7 Relate the structure of each of the major plant organs and tissues to physiological processes.
SC.912.L.17.10 Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.
SC.912.L.18.10 Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.
SC.912.L.18.9 Explain the interrelated nature of photosynthesis and cellular respiration.

Spice It Up! - Page 184

National Next Generation Science

MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
HS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

English Language Arts - Reading: Informational Text

LAFS.6.RI.1.2 Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
LAFS.6.RI.3.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
LAFS.7.RI.3.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.
LAFS.8.RI.1.2 Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
LAFS.8.RI.3.8 Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.
LAFS.8.RI.3.9 Analyze a case in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.
LAFS.910.RI.1.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
LAFS.910.RI.3.8 Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.
LAFS.1112.RI.1.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
LAFS.1112.RI.3.7 Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

English Language Arts - Writing

LAFS.68.W.1.1 Write arguments to support claims with clear reasons and relevant evidence. Introduce claim(s) and organize the reasons and evidence clearly. Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text. Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons.

LAFS.68.W.1.2

LAFS.910.W.1.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples. Use appropriate transitions to clarify the relationships among ideas and concepts. Use precise language and domain-specific vocabulary to inform about or explain the topic. Establish and maintain a formal style. Provide a concluding statement or section that follows from the information or explanation presented.

LAFS.6.W.3.7 Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.

LAFS.6.W.3.8 Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.

LAFS.7.W.2.6
LAFS.8.W.2.6
LAFS.910.W.2.6

LAFS.1112.W.2.6 Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources.

LAFS.7.W.3.7
LAFS.8.W.3.7
LAFS.910.W.3.7

LAFS.1112.W.3.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

LAFS.7.W.3.8
LAFS.8.W.3.8
LAFS.910.W.3.8

LAFS.1112.W.3.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

LAFS.910.W.1.1

LAFS.1112.W.1.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence. Develop claim(s) and counterclaims fairly, supplying evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level and concerns. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. Provide a concluding statement or section that follows from and supports the argument presented.

LAFS.1112.W.1.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

LAFS.1112.W.3.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

English Language Arts - Speaking and Listening

LAFS.68.SL.1.1
LAFS.910.SL.1.1
LAFS.1112.SL.1.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed. Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.

LAFS.6.SL.1.2 Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.

LAFS.6.SL.2.5
LAFS.7.SL.2.5 Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.

LAFSC.7.SL.2.4
LAFS.8.SL.2.4
LAFS.910.SL.2.4
LAFS.1112.SL.2.4

Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

LAFS.8.SL.2.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

LAFS.910.SL.1.2
LAFS.1112SL.1.2 Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

LAFS.910.SL.2.5
LAFS.1112.SL.2.5

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Reading Standards for Literacy in Science and Technical Subjects 6-12

LAFS.68.RST.1.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

LAFS.68.RST.3.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

LAFS.68.RST.3.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

LAFS.RST.910.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

LAFS.1112.RST.1.2

Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

LAFS.1112.RST.2.6

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Writing Standards for Literacy in History/Social Studies, Science and Technical Subjects

LAFS.68.WHST.1.1
LAFS.910.WHST.1.1

LAFS.1112.WHST.1.1
Write arguments focused on discipline-specific content. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
LAFS.68.WHST.2.6
Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
LAFS.68.WHST.3.7
LAFS.910.WHST.3.7
LAFS.1112.WHST.3.7
Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
LAFS.68.WHST.3.9
LAFS.910.WHST.3.9
LAFS.1112.WHST.3.9
Draw evidence from informational texts to support analysis reflection, and research.

Social Studies

SS.6.G.1.4 Utilize tools geographers use to study the world.
SS.8.E.3.1 Evaluate domestic and international interdependence.
SS.912.A.1.6 Use case studies to explore social, political, legal, and economic relationships in history.

Health

HE.6.B.1.1 Examine the validity of health information, products, and services.
HE.6.B.1.7 Investigate a variety of technologies to gather health information.
HE.6.B.3.1 Investigate health-related situations that require the application of a thoughtful decision-making process.
HE.6.B.3.4 Investigate healthy and unhealthy alternatives to health-related issues or problems.
HE.7.B.1.1 Analyze the validity of health information, products, and services.
HE.7.B.1.7 Access a variety of technologies to gather health information.
HE.7.B.3.1 Predict when health-related situations require the application of a thoughtful decision-making process.
HE.7.P.2.1 Articulate a position on a topic and support it with accurate health information.
HE.8.B.1.1 Evaluate the validity of health information, products, and services.
HE.912.B.1.1 Verify the validity of health information, products, and services.

Science

SC.912.L.17.6 Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.

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National Next Generation Science

MS-LS2-b. Ask questions to clarify the premise of the argument that organisms within different ecosystems obtain matter and energy in similar ways.
MS-ESS3-c. Construct and use oral and written arguments supported by empirical evidence to balance competing demands for various human uses of fresh water and biosphere resources
HS-ESS3-a. Construct explanations based on evidence for how the development of human societies has been influenced by natural resource availability.

English Language Arts - Reading: Informational Text

LAFS.68.RI.1.1
LAFS.910.RI.1.1
LAFS.1112. RI.1.1
Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
LAFS.68.RI.2.4
LAFS.910.RI.2.4
LAFS.1112. RI.2.4
Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
LAFS.6.RI.3.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

English Language Arts - Writing

LAFS.68.W.1.1
LAFS.910.W.11
LAFS.1112. W.1.1.
Write arguments to support claims with clear reasons and relevant evidence.

LAFS.68.W.1.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
LAFS.68.W.2.4
LAFS.910.W.2.4
LAFS.1112.W.2.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LAFS.68.W.2.6
LAFS.910.W.2.6
LAFS.1112.W.2.6 Use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of three pages in a single sitting.
LAFS.68.W.3.7
LAFS.910.W.3.7
LAFS.1112. W.3.7
Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.
LAFS.6.8W.3.8
LAFS.910.W.3.8
LAFS.1112.W.3.8 Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.

English Language Arts - Speaking and Listening

LAFS.68.SL.1.1
LAFS.910.SL.1.1
LAFS.1112.SL.1.1
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher- led) with diverse partners on grade level topics, texts, and issues, building on others' ideas and expressing their own clearly.
LAFS.910.SL.1.2
LAFS.1112.SL.1.2
Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
LAFS.68.SL.2.4
LAFS.910.SL.2.4
LAFS.1112.SL.2.4
Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.
LAF.68.SL.2.5
LAFS.910.SL.2.5
LAFS.1112.SL.2.5
Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.
LAFS.68.SL.2.6
LAFS.910.SL.2.6
LAFS.1112.SL.2.6
Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 6 Language standards 1 and 3 on page 52 for specific expectations.)

Health

HE.6.B.1.7: Investigate a variety of technologies to gather health information.
HE.7.B.1.7 Access a variety of technologies to gather health information.
HE.7.C.2.6: Evaluate the influence of technology in locating valid health information.
HE.8.B.1.7: Recommend a variety of technologies to gather health information.
HE.912.B.1.3: Evaluate the accessibility of products and services that enhance health.
HE.912.B.1.6: Justify the validity of a variety of technologies to gather health information.

Chapter 10: Additional Resources

- County Farm Bureau Offices
- University of Florida/IFAS County Extension Offices

County Contacts

For help with school garden questions or additional resources, contact your local county Farm Bureau or UF/IFAS Extension office.

Alachua County

Alachua County Farm Bureau
14435 NW US Hwy 441, Suite 20
Alachua, FL 32615-8812
(386) 418-4008

Alachua County Extension
2800 NE 39 Avenue
Gainesville, FL 32609-2658
(352) 955-2402

Baker County

Baker County Farm Bureau
539 South Sixth St.
Macclenny, FL 32063-2605
(904) 259-6332

Baker County Extension
1025 W Macclenny Avenue
Macclenny, FL 32063-4433
(904) 259-3520

Bay County

Bay County Farm Bureau
303 Mosley Drive
Lynn Haven, FL 32444-5605
(850) 872-2077

Bay County Extension
2728 E 14th St.
Panama City, FL 32401-5022
(850) 784-6105

Bradford County

Bradford County Farm Bureau
2270 N Temple Ave.
Starke, FL 32091-1612
(904) 964-6369

Bradford County Extension
2266 N. Temple Ave.
Starke, FL 32091-1612
(904) 966-6224

Brevard County

Brevard County Farm Bureau
111 Virginia Ave.
Cocoa, FL 32922-8655
(321) 636-4361

Brevard County Extension
3695 Lake Drive
Cocoa, FL 32926-4219
(321) 633-1702

Broward County

Broward County Farm Bureau
2121 North State Road 7
Margate, FL 33063-5713
(954) 972-2525

Broward County Extension
3245 College Ave.
Davie, FL 33314-7719
(954) 357-5270

Calhoun/Gulf County

Calhoun County Farm Bureau
17577 Main Street North
Blountstown, FL 32424-1768
(850) 674-5471

Calhoun County Extension
20816 Central Avenue E, Suite 1
Blountstown, FL 32424-2292
(850) 674-8323

Desoto/Charlotte County

Charlotte County Farm Bureau
1278 SE US Highway 31
Arcadia, FL 34266
(863) 494-3636

Charlotte County Extension
25550 Harbor View Road, Unit 3
Port Charlotte, FL 33980-2503
(941) 764-4340

Citrus/Hernando County

Citrus County Farm Bureau
617 Lamar Ave.
Brooksville, FL 34601
(352) 796-2526

Citrus County Extension
3650 W Sovereign Path, Suite 1
Lecanto, FL 34461-8070
(352) 527-5700

Clay County

Clay County Farm Bureau
3960 Lazy Acres Road
Middleburg, FL 32068-4908
(904) 282-0644

Clay County Extension
PO Box 278
Green Cove Springs, FL 32043-0278
(904) 284-6355

Collier County

Collier County Farm Bureau
1011 W Main St., Ste. 2
Immokalee, FL 34142-3651
(239) 657-6500

Collier County Extension
14700 Immokalee Road
Naples, FL 34120-1468
(239) 252-4822

Columbia County

Columbia County Farm Bureau
605 SW State Road 47
Lake City, FL 32025-0452
(386) 752-4003

Columbia County Extension
164 SW Mary Ethel Lane
Lake City, FL 32025-1597
(386) 752-5384

Dade County

Dade County Farm Bureau
1850 Old Dixie Highway
Homestead, FL 33033-3212
(305) 246-5514

Dade County Extension
18710 SW 288 St.
Homestead, FL 33030
(305) 248-3311

Desoto/Charlotte County

Desoto County Farm Bureau
1278 SE US Highway 31
Arcadia, FL 34266-7737
(863) 494-3636

Desoto County Extension
2150 NE Roan St.
Arcadia, FL 34266-5025
(863) 993-4846

Duval County

Duval County Farm Bureau
5542 Dunn Ave.
Jacksonville, FL 32218-4332
(904) 768-4836

Duval County Extension
1010 N McDuff Ave.
Jacksonville, FL 32254-2031
(904) 255-7450

Escambia County

Escambia County Farm Bureau
153 Highway 97
Molino, FL 32577-5553
(850) 587-2135

Escambia County Extension
3740 Stefani Road
Cantonment, FL 32533-7792
(850) 475-5230

Flagler County

Flagler County Farm Bureau
1000 Palm Coast Parkway SW,
Suite 202
Palm Coast, FL 32137
(386) 447-5282

Flagler County Extension
150 Sawgrass Road
Bunnell, FL 32110-4325
(386) 437-7464

Franklin County

Franklin County Extension
66 Fourth Street
Apalachicola, FL 32320-1775
(850) 653-9337

Gadsden County

Gadsden County Farm Bureau
2111 W. Jefferson St.
Quincy, FL 32351-1909
(850) 627-7196

Gadsden County Extension
2140 W Jefferson St.
Quincy, FL 32351-1905
(850) 875-7255

Gilchrist County

Gilchrist County Farm Bureau
306 W. Wade St.
Trenton, FL 32693-4150
(352) 463-2298

Gilchrist County Extension
125 E Wade St.
Trenton, FL 32693-0157
(352) 463-3174

Glades/Hendry County

Glades County Farm Bureau
PO Box 1365
LaBelle, FL 33975
(863) 675-2535

Glades County Extension
PO Box 549
Moore Haven, FL 33471-0549
(863) 946-0244

Calhoun/Gulf County

Gulf County Farm Bureau
17577 Main Street North
Blountstown, FL 32424-1768
(850) 674-5471

Gulf County Extension
200 N. 2nd St.
Wewahitchka, Florida 32465-0250
(850) 639-3200

Hamilton County

Hamilton County Farm Bureau
1117 US Hwy 41 NW
Jasper, FL 32052-5856
(386) 792-1458

Hamilton County Extension
1143 US Hwy 41 NW
Jasper, FL 32052-5856
(386) 792-1276

Hardee County

Hardee County Farm Bureau
1017 US Highway 17 N
Wauchula, FL 33873-8751
(863) 773-3117

Hardee County Extension
507 Civic Center Drive
Wauchula, FL 33873-9460
(863) 773-2164

Glades/Hendry County

Hendry County Farm Bureau
PO Box 1365
LaBelle, FL 33975-1365
(863) 675-2535

Hendry County Extension
PO Box 68
LaBelle, FL 33975-0068
(863) 674-4092

Citrus/Hernando County

Hernando County Farm Bureau
617 Lamar Ave.
Brooksville, FL 34601-3211
(352) 796-2526

Hernando County Extension
1653 Blaise Dr.
Brooksville, FL 34601
(352) 754-4433

Highlands County

Highlands County Farm Bureau
6419 US Highway 27 S
Sebring, FL 33876-5712
(863) 385-5141

Highlands County Extension
4509 W George Blvd.
Sebring, FL 33875-5837
(863) 402-6540

Hillsborough County

Hillsborough County Farm Bureau
100 S. Mulrennan Road
Valrico, FL 33594-3934
(813) 685-9121

Hillsborough County Extension
5339 S. County Road 579
Seffner, FL 33584-3334
(813) 744-5519

Holmes County

Holmes County Farm Bureau
1108 N. Waukesha Street
Bonifay, FL 32425-1406
(850) 547-4227

Holmes County Extension
1169 E Hwy 90
Bonifay, FL 32425-6012
(850) 547-1108

Indian River County

Indian River County Farm Bureau
7150 20th Street, Suite A
Vero Beach, FL 32966
(772) 562-4119

Indian River County Extension
1028 20th Place, Suite D
Vero Beach, FL 32960-5360
(772) 770-5030

Jackson County

Jackson County Farm Bureau
4379 Lafayette Street
Marianna, FL 32446-3367
(850) 482-5751

Jackson County Extension
2741 Pennsylvania Ave., Suite 3
Marianna, FL 32448-4022
(850) 482-9620

Jefferson County

Jefferson County Farm Bureau
105 W. Anderson St.
Monticello, FL 32344-1301
(850) 997-2213

Jefferson County Extension
275 N Mulberry St.
Monticello, FL 32344-1423
(850) 342-0187

Lafayette County

Lafayette County Farm Bureau
PO Box 336
Mayo, FL 32066-0336
(386) 294-1399

Lafayette County Extension
176 SW Community Circle, Ste D
Mayo, FL 32066-4000
(386) 294-1279

Lake County

Lake County Farm Bureau
30241 State Road 19
Tavares, FL 32778-4239
(352) 343-4407

Lake County Extension
1951 Woodlea Road
Tavares, FL 32778-4407
(352) 343-4101

Lee County

Lee County Farm Bureau
14180 Metropolis Ave. Suite 1
Fort Myers, FL 33912-4449
(239) 561-5100

Lee County Extension
3406 Palm Beach Blvd.
Fort Myers, FL 33916-3736
(239) 533-7400

Leon County

Leon County Farm Bureau
3375 Capital Circle NE, Bldg. C
Tallahassee, FL 32308
(850) 671-3276

Leon County Extension
615 Paul Russell Road
Tallahassee, FL 32301-7060
(850) 606-5200

Levy County

Levy County Farm Bureau
PO Box 998
Chiefland, FL 32644-0998
(352) 493-4780

Levy County Extension
PO Box 219
Bronson, FL 32621-0219
(352) 486-5131

Liberty County

Liberty County Farm Bureau
17577 Main Street North
Blountstown, FL 32424-1768
(850) 674-5471

Liberty County Extension
10405 NW Theo Jacobs Way
Bristol, FL 32321-0369
(850) 643-2229

Madison County

Madison County Farm Bureau
233 W. Base St.
Madison, FL 32340-2409
(850) 973-4071

Madison County Extension
184 NW College Loop
Madison, FL 32340
(850) 973-4138

Manatee County

Manatee County Farm Bureau
5620 Tara Blvd., Ste. 101
Bradenton, FL 34203-8865
(941) 746-6161

Manatee County Extension
1303 17th St. West
Palmetto, FL 34221-2934
(941) 722-4524

Marion County

Marion County Farm Bureau
5800 SW 20th St.
Ocala, FL 34474-9360
(352) 237-2124

Marion County Extension
2232 NE Jacksonville Road
Ocala, FL 34470-3615
(352) 671-8400

Martin County

Martin County Farm Bureau
506 SW Federal Highway, Suite 102
Stuart, FL 34994-2827
(772) 286-1038

Martin County Extension
2614 SE Dixie Highway
Stuart, FL 34996-4007
(772) 288-5654

Monroe County

Monroe County Extension
1100 Simonton St., Room 2-206
Key West, FL 33040-3110
(305) 292-4501

Nassau County

Nassau County Farm Bureau
PO Box 5007
Callahan, FL 32011-5007
(904) 879-3498

Nassau County Extension
543350 U.S. Highway One
Callahan, FL 32011-6486
(904) 879-1019

Okaloosa County

Okaloosa County Farm Bureau
921 W James Lee Blvd
Crestview, FL 32536-5136
(850) 682-3536

Okaloosa County Extension
3098 Airport Road
Crestview, FL 32539-7124
(850) 689-5850

Okeechobee County

Okeechobee County Farm Bureau
401 N.W. Fourth St.
Okeechobee, FL 34972-2550
(863) 763-3101

Okeechobee County Extension
458 Highway 98 North
Okeechobee, FL 34972-6303
(863) 763-6469

Orange County

Orange County Farm Bureau
PO Box 1329
Christmas, FL 32709
(407) 637-7727

Orange County Extension
6021 S Conway Rd.
Orlando, FL 32812-3604
(407) 254-9200

Osceola County

Osceola County Farm Bureau
1680 E Irlo Bronson Memorial Hwy
Kissimmee, FL 34744-3729
(407) 847-5189

Osceola County Extension
1921 Kissimmee Valley Lane
Kissimmee, FL 34744-6107
(321) 697-3000

Palm Beach County

Palm Beach County Farm Bureau
13121 North Military Trail
Delray Beach, FL 33484-1107
(561) 498-5200

Western Palm Beach Farm Bureau
3019 State Road 15
Belle Glade, FL 33430
(561) 996-0343

Palm Beach County Extension
559 North Military Trail
West Palm Beach, FL 33415
(561) 233-1712

Pasco County

Pasco County Farm Bureau
12445 US Highway 301
Dade City, FL 33525-6018
(352) 567-5641

Pasco County Extension
36702 State Road 52
Dade City, FL 33525-5138
(352) 521-4288

Pinellas County

Pinellas County Farm Bureau
1165 Lakeview Road
Clearwater, FL 33756-3586
(727) 466-6390

Pinellas County Extension
12520 Ulmerten Road
Largo, FL 33774-3602
(727) 582-2100

Polk County

Polk County Farm Bureau
1715 Highway 17 South
Bartow, FL 33830-6634
(863) 533-0561

Polk County Extension
PO Box 9005, Drawer HS03
Bartow, FL 33831-9005
(863) 519-8677

Putnam/St. Johns County

St. Johns County Farm Bureau
147 South US Highway 17
East Palatka, FL 32131-6070
(386) 325-5822

St. John's County Extension
3125 Agriculture Center Drive
St. Augustine, FL 32092-0572
(904) 209-0430

St. Lucie County

St. Lucie County Farm Bureau
3327 Orange Ave
Fort Pierce, FL 34947-3561
(772) 465-0440

St. Lucie County Extension
8400 Picos Road, Suite 101
Fort Pierce, FL 34945-3045
(772) 462-1660

Santa Rosa County

Santa Rosa County Farm Bureau
PO Box 490
Jay, FL 32565-0490
(850) 675-4572

Santa Rosa County Extension
6263 Dogwood Drive
Milton, FL 32570-3500
(850) 623-3868

Sarasota County

Sarasota County Farm Bureau
7289 Palmer Blvd.
Sarasota, FL 34240-9404
(941) 371-2043

Sarasota County Extension
6700 Clark Road
Sarasota, FL 34241-9328
(941) 861-9900

Seminole County

Seminole County Farm Bureau
PO Box 585694
Orlando, FL 32858-5694
(407) 889-9705

Seminole County Extension
250 W. County Home Road
Sanford, FL 32773-6189
(407) 665-5560

Sumter County

Sumter County Farm Bureau
7610 State Road 471
Bushnell, FL 33513-8734
(352) 793-4545

Sumter County Extension
7620 State Road 471, Ste. 2
Bushnell, FL 33513-8716
(352) 793-2728

Suwannee County

Suwannee County Farm Bureau
407 Dowling Ave, SE
Live Oak, FL 32064-3222
(386) 362-1274

Suwannee County Extension
1302 11th Street SW
Live Oak, FL 32064-3611
(386) 362-2771

Taylor County

Taylor County Farm Bureau
813 S Washington St.
Perry, FL 32347-3372
(850) 584-2371

Taylor County Extension
203 Forest Park Drive
Perry, FL 32348-6340
(850) 838-3508

Union County

Union County Farm Bureau
325 SE Sixth St.
Lake Butler, FL 32054-2627
(386) 496-2171

Union County Extension
25 NE First St.
Lake Butler, FL 32054-1701
(386) 496-2321

Volusia County

Volusia County Farm Bureau
3090 E. New York Ave.
DeLand, FL 32724-6408
(386) 734-1612

Volusia County Extension
3100 E New York Ave.
Deland, FL 32724-6410
(386) 822-5778

Wakulla County

Wakulla County Farm Bureau
2468 Crawfordville Highway
Crawfordville, FL 32327-2157
(850) 926-3425

Wakulla County Extension
84 Cedar Ave.
Crawfordville, FL 32327-2063
(850) 926-3931

Walton County

Walton County Farm Bureau
684 N. Ninth St.
DeFuniak Springs, FL 32433-3802
(850) 892-5512

Walton County Extension
732 N. Ninth St., Suite B
DeFuniak Springs, FL 32433-3804
(850) 892-8172

Washington County

Washington County Farm Bureau
1361 Jackson Ave.
Chipley, FL 32428-1774
(850) 638-1756

Washington County Extension
1424 Jackson Avenue, Suite A
Chipley, FL 32428-1602
(850) 638-6180