Lesson 1: The World of Edible Plants

TOTAL TIME REQUIRED: 165 minutes / 3 sessions
Session 1: **Getting Started** 45 min (Science)
Session 2: **Activity I "Deliciously Edible Plant Parts"** 60 min (Science)
Session 3: **Activity II "Fruits and Vegetables on *MyPlate*"** 40 min (Science/Health); **Reflect** 20 min (English Language Arts)

Key Message:
Know your food. Fruits and vegetables are foods from plants that help you eat smart and play hard.

Subject Connections:
Science, English Language Arts, Health

Learning Objectives:
Students will be able to…

- Identify fruits and vegetables that come from different parts of plants (root, stem, leaf, flower, fruit, and seed).
- Describe the function of each plant part.
- Explain how foods from plants fit into the five food groups.

Supplies:
- Plastic forks or toothpicks, paper plates, napkins
- **Garden Journals** (see p.13)
- Student handouts (pp. 63-65):
  1. ***Deliciously Edible Plant Parts***
  2. ***Fruits and Veggies on MyPlate***
- Art supplies (for **Garden Journals**)
- ***Eat Smart To Play Hard With MyPlate*** poster

Featured Fruits and Vegetables:
Chickpeas (garbanzo beans) (seeds)
Broccoli (flowers)
Zucchini (fruits)
Celery (stems)
Green leaf lettuce (leaves)
Carrots (roots)
Provide samples for students to observe and taste, either from the garden or purchased from a market. Provide water (and cups) for students to drink as they taste the vegetables.

LESSON OVERVIEW:

In this first lesson, students will discover how foods from the garden fit into a healthy diet. Students will explore different types of gardens, and form their garden rules and garden teams. They will learn the function of different plant parts, and classify plants according to what part is edible. Finally, students will be introduced to the ***MyPlate*** icon, a reminder to eat from the five food groups, and discover how they can eat smart to play hard with fruits and vegetables!

ESSENTIAL QUESTIONS: *What is a garden and what types of gardens exist? What plants do we eat? Why do we eat some plants and not others? What fruits and vegetables can we grow in the garden?*

PREPARATION AND ADDITIONAL SUPPLIES:

- Prepare the following before class:
  For observation only: Garden Groceries Bag or covered tray containing whole broccoli with stalk, carrot with green leafy top, chickpeas in clear plastic bag, whole zucchini, green leaf lettuce, and a celery stalk. Provide cut samples that allow students to see both the outside and inside of the vegetable. Cut them in half ahead of time. *(If you have a large class, you may want to provide more samples of each item for students to observe.)*
  For tasting: Prepare and set up six **Plant Part Tasting Stations** with enough samples to allow each child to taste each plant part.
  Note: *See p. 4 for information on the safe handling and preparation of foods for tasting. Use fresh food samples; do not reuse foods that have been touched and handled in the* ***Garden Groceries*** *activity.*
- Access to sink with warm, running water and soap
- Images of different types of gardens sourced online to display via a projector, or printed out (for example, flower, herb, vegetable, rock, roof, container, royal, and water gardens)
- **Optional Class Experiment "A Colorful Dissection" (p. 17):** *Celery (stems with leaves), clear vase, food coloring, white flower (carnation) with stem, paring knife (for teacher only)*
- **Optional "Grow Celery From Celery" (p. 18):** *Celery (base only), small dish, water*

TEACHING PROCEDURE:

Introduce: Introduce students to the unit ***Dig In!*** Explain that the class will embark on an exciting journey through the garden where they will explore fruits and vegetables by learning how to grow, prepare, and taste them, and discover how they can help us grow and stay healthy.

GETTING STARTED (45 minutes, Science)

1. Begin by asking students: *What is a garden? What types of gardens do you know of, or have you seen? How are gardens used?* Invite students to share their answers and then show them images of different types of gardens (for example, flower, herb, vegetable, rock, roof, container, royal, formal water-garden). Discuss how gardens are planned spaces for the enjoyment of nature as well as for the purpose of growing specific plants on a comparatively small scale, such as fruits, vegetables, or flowers. Gardens can be small or large, indoors or outdoors, in the ground or in a container, and can incorporate natural or man-made materials (such as planters or fountains) into the design.

2. Ask students if they think farms are the same as gardens. Explain that farms are larger gardens, or agricultural spaces, specifically designed for the purpose of growing or producing food (such as fruits, vegetables, grains, or animals), flowers, fibers (such as cotton or wool), or fuel (such as wood or corn) to sell or to sustain the farmer's family and livestock.

DIG IN! STARTERS

Garden Journals: Introduce students to their **Garden Journals**, a notebook they will use throughout the unit for observations, predictions, questions, reflections, and notes. Encourage students to write neatly, as this journal will be their personal resource. Help them organize their notes by designating sections for class notes, new vocabulary, and personal reflections. Invite students to create their own unique cover designs, make drawings of plants, craft collages, and collect recipe clippings, articles, and garden samples.

Garden Orientation: If you already have a school garden, tour it with your students. If not, discuss the different types of gardens you can create **(pp. 92-93),** explain the advantages and disadvantages of each, and take a tour of the school campus to identify possible sites.

Garden Rules and Safety: Take this opportunity to identify and discuss the important features of the garden (tools used, water source, compass orientation, access to sunlight). Explain or establish rules for the garden (for example, return tools to the shed when finished using). **(p. 92)**

Garden Teams: Divide your class into garden teams (of four to five students), and rotate teams through various garden jobs each week so that they all get a chance with every task. **(p. 94)** Notice suggestions for garden teams in each lesson, whether you already have a garden or are just starting one.

Tasting Etiquette Guidelines: Explain to students that they will prepare and try different foods throughout the unit. As a class, collaborate to create rules for all tasting activities. (For example, if you don't like something, spit it out discreetly into a napkin, don't make faces, be respectful to others, don't let your personal preferences influence your peers, chew slowly to truly taste the food.) Write these rules on the board and have students copy them into their **Garden Journals**. You may want to create a colorful poster with these guidelines to keep on display at all times. Remind students of them before every tasting activity. Point out that sometimes a person does not like a food the first time he or she tries it. But, after tasting that same food many times, or perhaps prepared a different way, it can become a food that the person loves to eat.

IMPORTANT FOOD SAFETY STEPS!

Please see p. 4 for a reproducible handout to post in a visible location in your classroom. It is important that you follow these steps to keep yourself, your students, and any parents or volunteers safe and healthy.

Hand Washing:
All persons participating in the food preparation activity (teachers, students, volunteers, parents) should wash hands before and after preparing, handling, or sampling foods.

DIG DEEPER!

- Pair up students to research a plan part and its function using at least two sources, and invite them to report back to the class what they learned. Ask them questions like: *What does the plant part do? Which plant parts are involved in the following plant processes: germination, transpiration, photosynthesis, pollination, and respiration?*

- Assign each pair a featured fruit or vegetable. Have them diagram the life cycle of that fruit or vegetable's plant and "life" (i.e., seed, germination, root/seedling growth, plant development, flowering plant, pollination, fruiting plant/seed production, and death of plant/decomposition).

LEARNING ACTIVITIES

Prepare: *Bring students into the garden if any of the following items are growing and/or ready to harvest.* **(p. 104)**

For the ***Garden Groceries*** *activity, provide samples of the following foods (for observation only) in a large grocery bag or hidden on a tray: chickpeas/garbanzo beans (if using canned, rinse and drain) contained in a clear plastic baggie, whole broccoli with stalk, whole zucchini, celery stalk with base and leaves, green leaf lettuce, and a carrot with green leafy top. Provide the whole item, so students can see how it grows. Offer a cut example of each plant part so that students can see both the exterior and interior of the fruit or vegetable. It is valuable for children to touch and observe actual produce, but if this is not possible, you can still perform the activity using images.*

For the six ***Plant Part Tasting*** *activities, provide samples of the following foods at different stations (all rinsed and ready-to-eat): canned chickpeas/garbanzo beans* **(seed)**, *broccoli florets* **(flower)**, *zucchini slices* **(fruit)**, *celery sticks* **(stem)**, *green leaf lettuce* **(leaf)**, *and carrot sticks* **(root)**. *Provide each student with a paper plate, a plastic fork or toothpick, and a napkin.*

Alternate options may be used if the above are not available: sunflower seeds **(seed)**, *cauliflower* **(flower)**, *melon* **(fruit)**, *asparagus* **(stem)**, *romaine lettuce* **(leaf)**, and *beet** **(root)**. **Beets for tasting should be cooked ahead of time, or use canned beets.*

Activity I. Deliciously Edible Plant Parts (60 minutes, Science)

Teacher Tip! *Use this activity as an introduction to studying plant cells.*

1. Introduce students to fruits and vegetables by playing a guessing game called **Garden Groceries**. Invite volunteers, one at a time, to pick an item from the **Garden Groceries** tray or bag. Ask them to identify the produce for the class to see.

2. Ask: *What are we eating when we eat a fruit or vegetable?* List the parts of a plant on the board: **seed, flower, fruit, stem, leaf**, and **root**. Explain that we are not eating an entire plant – we are eating an edible part from a plant. "Edible" means that it is safe for you to eat.

   Note: *It is important to explain that not all plants or plant parts are edible. Some plants are poisonous, while others have parts that are edible, as well as parts that are not. (For example, rhubarb stems are edible, while the leaves are poisonous.)*

3. Distribute the handout ***Deliciously Edible Plant Parts*** (pp. 63-64) to each student. Challenge students to identify each fruit or vegetable pictured, and then guess the plant part it comes from. Have students share their answers.

Plant Anatomy and Edible Plant Parts

A carrot is the **root** of the plant. **Roots** grow underground, provide support for a plant by holding it into the ground, and collect food (water and nutrients) from the soil.

Celery is the **stem** of the plant. **Stems** provide aboveground physical support to the plant, and contain the "highways" of vessels to move water and nutrients through the plant. (See **Science Extension** sidebar on p.18 for an experiment with celery that demonstrates how this plant part functions.)

Salad comes from the **leaf** of the lettuce plant. **Leaves** make food for the plant from sunlight (**photosynthesis**).

Broccoli is the **flower** of the plant. **Flowers** attract pollinators (bees, butterflies, moths, flies, hummingbirds) and mature into fruits.

Zucchini is the **fruit** of the plant. **Fruits** grow from flowers, and protect and hold the seeds.

Chickpeas (also known as garbanzo beans) are the **seeds** of the plant. **Seeds** contain all the information needed for plant life. They grow into new baby plants when conditions are right.

4. Identify each plant part clearly and show what parts we eat when consuming carrots, salad, broccoli, celery, zucchini, or chickpeas. Once students are familiar with, and can correctly identify, each plant part, explain that each part is designed to support an important function necessary for the plant to live. Review each plant part and its function together using the **Plant Anatomy** sidebar above. Have students create a three-column chart in their **Garden Journals**, writing each plant part in the left-hand column, explaining its function in the middle, and drawing a small diagram of each part on the right.

5. Have students notice the texture and color of the outside and inside of each plant part sample while discussing the function of each. (For example, show students the fleshy fruit of a zucchini that surrounds the seeds.) Explain that a fruit protects and holds the seeds. Do the same type of observation with other plant parts, and ask students to discuss their similarities and differences in shape, size, texture, and color, reminding them to take notes in their **Garden Journals**.

6. Next, students will taste fruit and vegetable samples from each plant part. Remind students of the **Tasting Etiquette Guidelines**. Have students and any adult volunteers wash their hands following the proper hand-washing steps (see p. 5). Split students into six groups and direct them to the **Plant Part Tasting Stations** (p.12), where students will observe, study, taste, and take notes on various edible plant parts in their **Garden Journals**. For each fruit or vegetable sample they try, ask them to chew slowly, then write down their tasting observations, noting the flavor, texture, and appearance.

7. What other fruits and vegetables can students think of, and what edible plant parts are they? Have students challenge and quiz one another by reading a function and identifying an edible plant part that matches that function. Discuss student answers and list them on the board under **seed, flower, fruit, stem, leaf**, or **root**. (See **Plant Part Groceries** sidebar on p.16 for more options.)

PLANT PART GROCERIES

Introduce students to other edible plant parts by showing a variety of fruits and vegetables in their full plant form. They may recognize them when displayed in the produce section of the market, but not when part of the plant. Show pictures from the Internet or a gardening book or visit a garden or farmers market to view them firsthand.

Roots: beet, radish, turnip, carrot, parsnip

Stems: rhubarb, asparagus, celery

Leaves: spinach, kale, arugula, collard greens, Brussels sprouts, cabbage

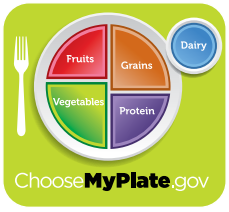
Flowers: artichoke, cauliflower, broccoli

Fruits: strawberry, melon, pepper, tomato, pumpkin, cucumber, winter squash

Seeds: chickpeas (garbanzo beans), sunflower seeds, pumpkin seeds, corn, green peas, black beans

Activity II. Fruits and Vegetables on *MyPlate* (40 minutes, Science/Health)

1. Explain that the way we group and organize living things in science is called **classification**. To **classify** is to arrange things in groups according to common characteristics. Edible plant parts can be classified in a variety of ways. **Botanists** *(plant scientists)* and **nutritionists** *(food and health experts)* classify plant parts differently. Botanists classify edible plant parts based on their function and where in the plant they are located. (For example, tomatoes, zucchini, and red bell peppers are considered by botanists to be fruits because they contain seeds). Nutritionists, however, call them **vegetables** and organize foods (including those that come from edible plant parts) into different food groups based on what they provide to keep the body healthy, how they taste, and also how they are normally eaten. (For example, tomatoes are normally eaten as a vegetable, such as in a garden salad or with lettuce and onion on a sandwich.) Tomatoes are also not tart and sweet like cherries and other foods we consider to be fruits. That's why nutritionists consider tomatoes a vegetable instead of a fruit.

2. 

Distribute the handout ***Fruits and Veggies on MyPlate*** (p. 65). Ask: *What other plant foods can you think of that are classified differently by botanists and nutritionists?* (For example, cucumbers, pumpkins, yellow squash.) Show students the ***MyPlate*** icon on the ***Eat Smart To Play Hard With MyPlate*** poster. Ask students to identify the different plate segments (i.e., food groups) on the ***MyPlate*** icon: **Fruits, Vegetables, Grain, Protein Foods**, and **Dairy**. Explain that most of the foods we eat belong to one of these food groups, and edible plants can be found in many of them. It's important to eat foods from all five food groups; that's how we eat smart to play hard. Ask students what food groups they think include edible plant parts. Allow students to answer. Explain that the **Fruit Group**, the **Vegetable Group**, and the **Grain Group** all include foods that come only from plants. Students may not realize that grains also come from plants.

Any food made from wheat, rice, oats, cornmeal, or barley is a grain food. Tell students that grains, such as wheat, oats, and rice, come from the seed part of plants. Ask students if they can name any foods from the **Grain Group**? (For example, bread, cereal, tortillas, and pasta.)

The remaining two food groups are the **Dairy Group** and the **Protein Foods Group**. The **Protein Foods Group** contains some edible plant products like beans, split peas, nuts, and seeds, as well as nonplant (animal) foods like seafood, meat, eggs, and poultry. The **Dairy Group** includes milk and milk products.

3. Explain that the ***MyPlate*** icon reminds us to eat foods from each food group. What does the icon tell us about how much of our plate should be fruits and vegetables? *(Half of our plate at meals should be fruits and vegetables, with a little more coming from the **Vegetable Group**.)*

Have students work in pairs to complete the handout, ***Fruits and Veggies on MyPlate.*** They will analyze a sample school lunch menu consisting of cheese pizza (with a whole-wheat crust), baked sweet potato fries, broccoli florets, applesauce, and fat-free milk. Students will identify the ingredients, what food groups are represented, whether it comes from a plant, and, if so, what part of the plant. The first food item (the pizza crust) is provided as an example on the handout.

4. Go over the student handout activity using the answer key, allowing students to first share their answers and reasoning. Correctly identify the fruits and vegetables featured in the lunch menu.

STUDENT HANDOUT ANSWER KEY: Fruits and Vegetables on *MyPlate*

Menu Item	Original Ingredient	Food Group	Does it Come From a Plant?	Edible Plant Part
Whole-Wheat Cheese Pizza[1] **a. Crust**	wheat flour	Grain	yes	seed
b. Tomato Sauce[2]	tomato	Vegetable	yes	fruit
c. Cheese	milk	Dairy	no	x
Baked Sweet Potato Fries	sweet potato	Vegetable	yes	root
Broccoli Florets	broccoli	Vegetable	yes	flower
Apple Sauce	apples	Fruit	yes	fruit
Fat-Free Milk (8 oz)[3]	milk	Dairy	no	x

[1] *Pizza is a combination food with three main ingredients: crust, tomato sauce, and cheese (topping). What other combination foods can your students think of?* (For example, a sandwich, taco, burrito, mixed salad, or chili.)

[2] *Remind students that tomatoes are the fruit part of the plant. Nutritionists consider them a vegetable because of the nutrition tomatoes provide and how they are eaten.*

[3] *Explain that milk comes from an animal, a cow, and therefore is not a food that comes from a plant. However, cows eat plants, which give them energy to make milk.*

DIG DEEPER! Optional CLASS EXPERIMENT (SCIENCE)

A Colorful Dissection

Time Required: 20 minutes for preparation and reflection; 6 hours for observation

This experiment is best done first thing in the morning to observe throughout the day. There is a lot going on inside a plant, and sometimes the best way to understand that is to open up the plant and take a look. This experiment will show, both outside and in, how a stem works to bring water and nutrients up from the plant's roots, through the stem, and out to the tips of its leaves or petals. Ask for students to help you in all steps except those marked (T) for teacher only.

You will need:

- Celery, with as many leaves as possible on the tops
- A white flower, such as a carnation, with stem
- 2 tablespoons of food coloring (red or blue work best)
- A clear vase
- A paring knife (T)

Steps:

1. Fill the vase with water and add the food coloring.
2. (T) Cut ½" off the bottom of the celery stem with a knife and do the same to the flower stem. Make sure you leave the flower blossom and the celery leaves intact.
3. Place the cut end of each stem into the colored water.
4. Ask students to hypothesize what will happen.
5. After 6 hours, observe the outside of the plants – the celery's leaves and the petals of the flower. Does the colored water appear in the leaves and petals?
6. (T) Take the flower and the celery out of the vase, use the knife to cut the stem, and look at the cross section. Observe the vein-like tubes filled with colored liquid. This will be especially noticeable with the celery.

GROW CELERY FROM CELERY! (SCIENCE)

Grow celery using the base of your celery stalks. Students will be interested in learning that a plant part they are accustomed to throwing out can be "recycled" into a new plant!

Cut off the base of a celery stalk. Let students then place the celery base upright in a small dish of water. They should make notes on how long it takes for new leaves to appear in the center of the celery base (approximately one week). Have students note the color of the leaves (yellow) and ask if that color surprised them. Were they expecting the leaves to be green? Once the leaves grow and turn green, the celery base is ready to plant in the ground or in a pot. The students have grown their own celery plant!

REFLECT (30 minutes, English Language Arts)

1. Have students reflect in their **Garden Journals** on what they have learned. Ask: *What was your favorite fruit or vegetable? Were there any foods you tried for the first time? What were they? What surprised you the most about this lesson?*

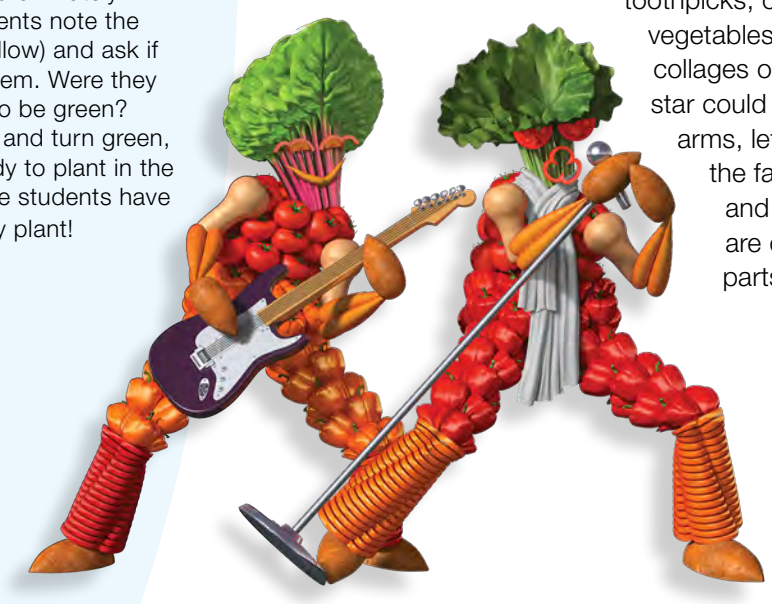
2. Next, have students imagine what their school garden might be like. Review the different types of gardens discussed in the beginning of the lesson. Encourage students to draw or make notes about the characteristics of their imagined garden, such as whether it will be in-ground or in a container, and to list what they would like to grow. Remind students that their **Garden Journals** are for their personal thoughts and reflections (in addition to new vocabulary, notes, and drawings).

EXTENSIONS

Cafeteria Connection. Arrange a visit to the cafeteria so students can meet the Food Service Director and staff, and learn what they do. Have students study the lunch menu to discover how many edible plant parts are featured in that day's lunch.

Plant Invasion. Discuss how edible plants could take over their after-school snack. Can students think of a tasty snack made out of at least three edible plants?

Nature's Rock Stars. Have students create an original fruit and/or vegetable rock star as a fun exercise to demonstrate the edible parts of plants. They can either build a new plant person using parts of the fruits and vegetables you gathered for them, assembling them with toothpicks, or, if not using real fruits or vegetables, they could use images to create collages or drawings. (For example, their rock star could have the body of a carrot, celery arms, lettuce clothes, a zucchini slice for the face, a broccoli floret for the hair, and chickpeas for eyes.) When they are done, they should identify the plant parts used.



Deliciously Edible Plant Parts (Page 1 of 2) LESSON 1 HANDOUT 1

Name: _____ **Date:** _____

Fruits and vegetables are the deliciously edible parts of a plant!

Identify! Look at the images below and see if you can identify each fruit or vegetable. Can you identify what part of the plant it comes from? What other fruits or vegetables can you think of that come from the same part of a plant?

Explain! Each plant part has an important job. Explain and write down the function of each plant part, then try quizzing your friends!

Taste! Use your senses to write down your observations in your **Garden Journals** from the **Plant Part Tasting Station** activity. Describe **the flavor** (for example, sweet, salty, sour, bitter), **the texture** (for example, crunchy, soft, crisp), and **the appearance** (color, shape, size).

- chickpeas
- zucchini
- leaf lettuce
- broccoli
- celery
- strawberries
- carrots
- tomatoes
- green beans

1. _____

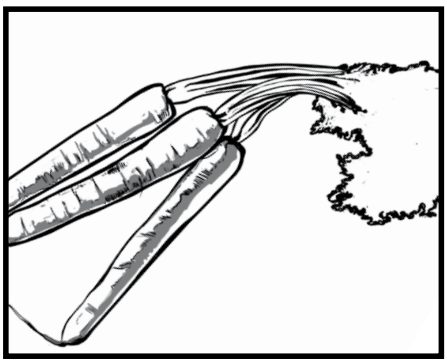
Plant Part: _____

Other fruits or vegetables of the same plant part:

_____

_____

Function: _____



2. _____

Plant Part: _____

Other fruits or vegetables of the same plant part:

_____

_____

Function: _____

3. _____

Plant Part: _____

Other fruits or vegetables of the same plant part:

_____

_____

Function: _____

Deliciously Edible Plant Parts (Page 2 of 2)

Name: _____ **Date:** _____

4. _____

Plant Part: _____

Other fruits or vegetables of the same plant part:

_____

_____

Function: _____

5. _____

Plant Part: _____

Other fruits or vegetables of the same plant part:

_____

_____

Function: _____

6. _____

Plant Part: _____

Other fruits or vegetables of the same plant part:

_____

_____

Function: _____

7. _____

Plant Part: _____

Other fruits or vegetables of the same plant part:

_____

_____

Function: _____

8. _____

Plant Part: _____

Other fruits or vegetables of the same plant part:

_____

_____

Function: _____

9. _____

Plant Part: _____

Other fruits or vegetables of the same plant part:

_____

_____

Function: _____

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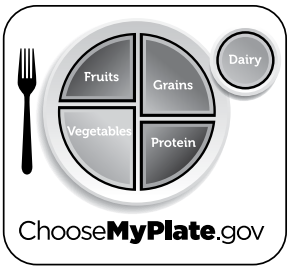
Fruits and Veggies on MyPlate

LESSON 1 HANDOUT 2

Name: _____ **Date:** _____



Edible plant parts are found in more than two of the five ***MyPlate*** food groups we need each day for good health. Do you know which ones? (Circle them below).

Fruit Group **Vegetable Group** **Grain Group** **Protein Foods Group** **Dairy Group**

Look at the school lunch menu below and fill in the table by answering the following questions:

1) What is the original ingredient?
For each menu item, list the major ingredient from which it was made. Pizza is a combination food made up of foods from three food groups. Provide answers for each food in the pizza, as well as for the rest of the meal.

2) What food group does it belong to?

3) Did it come from a plant? Answer "yes" or "no."

4) Which edible plant part is it?

Lunch Menu Item	Original Ingredient		Food Group	Does It Come From a Plant? (yes/no)	Edible Plant Part
WHOLE-WHEAT CHEESE PIZZA	a. Crust (example)	Wheat Flour	Grain Group	Yes	Seed
	b. Tomato Sauce				
	c. Cheese				
BAKED SWEET POTATO FRIES					
BOWL OF BROCCOLI					
APPLESAUCE					
FAT-FREE MILK					

5) What fruits and vegetables are on this menu? List them: _____

Lesson 2: Farm to Plate

TOTAL TIME REQUIRED: 190 minutes / 3 sessions
Session 1: **Getting Started** 30 min; **Activity I "The Farm to Plate Game"** 40 min (Science/ Social Studies)
Session 2: **Activity II "Map the Distance"** 60 min (Math)
Session 3: **Activity III "Harvest, Prepare, and Taste Dark-Green Leafy Greens!"** 30 min (Health); **Reflect** 30 min (English Language Arts)

LESSON OVERVIEW:

In this lesson, students explore the food system and participate in activities that help them understand the route fruits and vegetables take from farms to their plates. Students will discuss what it means for a fruit or vegetable to be locally grown, and the benefits of local foods. They will "dig deeper" into the delicious options among dark-green leafy vegetables by working to identify, taste, and compare items such as kale, spinach, and leaf lettuce, and discover ways to include them at snacks and meals.

ESSENTIAL QUESTIONS: *Where does my food come from? Where does its journey to my plate begin? How far does it travel?*

TEACHING PROCEDURE:

GETTING STARTED (30 minutes)

1. Begin by asking students to write down the name of everything they ate or drank during their last meal (breakfast, lunch, or dinner) in their **Garden Journals**. Tell them to underline the name of the foods that came from a plant *(fruits, vegetables (including beans), grains, nuts, seeds).*

2. Ask students: *Where does your food (fruits and vegetables) come from? Where does its journey to your plate begin? How far does it travel?* Use a bag of spinach as an example. Some students may say the grocery store or supermarket. If so, encourage students to think about how the spinach got to the market. Explain that fruits and vegetables come from a farm, orchard, or garden, where they are grown and harvested. *(Review from Lesson 1.)*

3. Ask: *How many steps would spinach have to travel from the school garden to the cafeteria?* To help students develop an understanding of the distance their food travels from farm to plate, ask students to predict, and then count, the number of steps it takes to get from the garden to the cafeteria. Have students note and map this journey in their **Garden Journals**. ***Note:*** *You could also measure the steps from any other two points in the school for this example.*

4. Ask: *How many miles do they think spinach would travel if it came to them from a farm?* Allow students to think about and discuss their answers. They would have to know which farm it came from. Point out that although it's impossible to tell where a fruit or vegetable was grown just by looking at it, one can find out by looking at the packaging, signs in the grocery store, or by buying from a farmer directly (for example, at a farmers market). The next activity will allow students to further explore the steps and journey of food from farm to plate.

Key Message:

Add spinach to your sandwich. Make a salad. Eat your greens. They're nature's rock stars!

Subject Connections:

Science, Math, Health

Learning Objectives:

Students will be able to...

- Explain the food system and describe how food travels from where it is grown to their plate.
- Describe how plants are connected to the foods people eat.
- Grow (and harvest) a dark-green leafy vegetable and describe its taste.
- Demonstrate and explain the importance of hand washing and properly cleaning fruits and vegetables before eating them.

Supplies:

- Access to sink with warm, running water and soap
- Access to a food-preparation sink (for students to rinse leafy greens)
- Large bowl(s) to rinse leafy greens, paper towels
- Salad spinner, forks, paper plates, small bowls for salad dressing; 2 baking pans, spatula (optional for Crispy Kale Chips recipe p. 24)
- **Garden Journals**
- Teacher handout (p. 66): 1.***The Farm to Plate Game***
- Student handout (pp. 67-68): 2. ***Dark-Green Leafy Vegetable Taster***
- ***Dig In!*** poster – ***Leafy Green DJ***

Featured Fruits and Vegetables:

Spinach, green leaf lettuce, and kale*
Provide enough samples for students to observe and taste, either from the garden or purchased from a market. Provide water (and cups) for students to drink as they taste the vegetables. *(*Optional: Try offering cooked kale. See recipe on p. 24.)*

Additional Foods:

Samples of three salad dressings (for example, olive oil and vinegar, ranch dressing, Russian dressing).

DIG DEEPER! (SOCIAL STUDIES)

- Ask students to think about what happens to food scraps and empty food containers/packaging. If you throw them away, where do they go? Have students brainstorm and discuss in small groups, then report back. Explore these options in the waste management step of the food system:
  1. Leftover fruit and vegetable scraps may be thrown into the garbage and then transported to a landfill or incinerator.
  2. Or, leftover fruits and vegetables may be added to a compost pile. Compost, a form of recycling, is a collection of once-living things or their products (such as fruit and vegetable scraps, grass, coffee grounds, and nut shells) that have been decomposed by helpful microorganisms. Compost is used by farmers and gardeners to add nutrients back to the soil for new plants.
  3. Food packaging also goes into the garbage or may be recycled. Some communities recycle materials such as paper, cardboard, plastic, aluminum, glass, and tin. During recycling, these products are processed and transformed for another use.
- Students can talk with the School Food Service Director to learn about any existing school composting or recycling programs and efforts to reduce food waste in the cafeteria.
- Assign **Garden Teams** to start and maintain a compost for the school. Add only plant products, such as fresh fruit and vegetable culls from food production (apple and pear cores and vegetable trimmings), to a school compost pile. Other plant material, such as grass clippings, leaves, and twigs may be added to fruit and vegetable clippings. Do not use animal products, animal waste, or any cafeteria waste in a compost pile, as it might contain animal products.
- Students can weigh the amount of plant and vegetable waste before the program and then compare it to the amount of waste after the program. ***Note:*** *Reach out to community gardens or your local Cooperative Extension Office for help and expertise with compost.*

LEARNING ACTIVITIES

Activity I. The Farm to Plate Game (40 minutes, Science/Social Studies)

See "Dig Deeper" in sidebar on left for Social Studies connection.

Prepare: *Print out and cut the cards on* ***The Farm to Plate Game*** *handout (p. 66) to use for the game. See instructions for play on p. 25.*

1. Explain that many of the fruits and vegetables we eat travel great distances before they reach us. The term "**food system**" is used to describe all the steps, processes, resources, and people involved in getting food from a farm to our plate. Share with students that most fruits and vegetables eaten in America travel hundreds of miles before they reach our plates. In one study, researchers learned that fruits and vegetables traveled on average about 1,500 miles from the farm where they were grown to the Chicago Terminal Market!

2. List the following food system steps on the board and discuss what happens in each:
   1) Production: Growing and harvesting fruits and vegetables
   2) Processing: Washing, cutting, mixing, and packaging fruits and vegetables
   3) Distribution: Transporting, storing, marketing (i.e., advertising), and selling fruits and vegetables
   4) Consumption: Preparing and eating fruits and vegetables
   5) Composting/Recycling: Uneaten food scraps are disposed of (either composted to return nutrients to the soil or sent to a landfill).

3. In this next activity, students will play ***The Farm to Plate Game*** where each student represents a different role within the food system. Hand out one Farm to Plate card (p. 66) to each student, starting with farmer (or producer) and ending with Compost/Waste Manager. Allow students a few minutes to study their cards. (See p. 25 for teacher instructions on how to play the game, definitions of each role, and answer key.)

4. Next, give students 10 minutes to arrange themselves in the order of the steps a fruit or vegetable travels from the farm to a person's plate. Discuss each role and make corrections. To show the food system in action, pass a vegetable (for example, a spinach leaf or bag of spinach) through the supply chain starting with the producer and ending with the consumer. Have students announce their role when they are handed the vegetable. Ask students to share their understanding of the food system and discuss any thoughts they have about the process and steps.

FIND OUT WHERE IT GROWS

Explore these online resources with your students to find out more about where fruits and vegetables are grown, and where they can be found near you.

U.S. crop charts:
http://www.nass.usda.gov/Charts_and_Maps/Crops_County/index.asp
Find a local farmers market:
http://search.ams.usda.gov/farmersmarkets/
School garden information:
http://healthymeals.nal.usda.gov/resource-library/school-gardens
Your State Department of Agriculture:
http://www.rma.usda.gov/other/stateag.html

Activity II. Map the Distance (40 Minutes, Math/Social Studies)

1. Explain that the distance our food travels depends on how many steps in the food system it goes through, and how far away the food was grown. (For example, a vegetable grown in Chile will travel farther to get to your plate than one that is grown in your garden.) Have students further explore the journey from farm to table with the following math challenge. Map the distance between different spinach farms and the students' location.

   First, explain that spinach is considered a cool season crop that grows best in 50-60 ºF temperatures. California, Arizona, Texas, and New Jersey grow the most fresh spinach in the United States. California's mild climate allows farmers to grow spinach all year long. China is the world's leading producer of spinach; however, most of the spinach that the United States imports comes from Mexico.

2. Next, ask students to write down the following locations,* where spinach is grown, in their **Garden Journals**:
   - California (Monterey County)
   - Arizona (Yuma County)
   - Texas (Winter Garden agricultural region southwest of San Antonio)
   - China (Beijing)
   - Mexico (Yucatán Peninsula)
   - Farm near school: _____

   ***Note:** This is a partial list only.*

   Using an atlas, world map, or online map, have students first determine how many miles each spinach farm is from their hometown.

3. Next, reveal that there are 5,280 feet in a mile. That works out to approximately 2,640 steps in a mile. Have students multiply the miles from each spinach farm to their school by 2,640 to calculate the steps it would take if they were to walk the distance. Have students plot and map the distance to scale using graph paper. Provide them with a scale to follow (for example, one grid square equals 100 miles).

4. Ask students to draw conclusions about the food system. How can it be simplified and what are some benefits of a simpler supply chain? Ask students to explain how growing or eating food from **local** sources (see sidebar on p. 22 for definition) could benefit themselves, farmers, and their community. *(Knowing where your food comes from and how it's grown, certain fruits and vegetables may be easier to find, freshly picked produce tastes great, buying local supports local farmers.)* What are the disadvantages? *(Fruits and vegetables are only available during the area's growing season, limited variety.)* What are some places in your community where you can buy locally grown fruits and/or vegetables?

Teacher Tip!
Use the food system activity to connect and draw comparisons to other systems and cycles, such as the water cycle or life cycle.

DISTANCE REFERENCE

If you don't have access to an online map or atlas, use the following distances as a guide:

These distances are an approximation. Point out to students that the task is not to get the mileage exactly right, but to give them an idea of the differences between spinach traveling internationally, and spinach traveling regionally and locally to their plate.

Distance from California (Monterey County) to New York, NY: 2,989 miles

Distance from Arizona (Yuma County) to New York, NY: 2,551 miles

Distance from Texas (Winter Garden region) to New York, NY: 1,933 miles

Distance from Beijing, China to New York, NY: 6,830 miles

Distance from Mexico (Yucatán Peninsula) to New York, NY: 3,263 miles

IMPORTANT FOOD SAFETY STEPS!

Please see p. 4 for a reproducible handout to post in a visible location in your classroom. It is important that you follow these steps to keep yourself, your students, and any parents or volunteers safe and healthy.

Hand Washing:
All persons participating in the food preparation activity (teachers, students, volunteers, parents) should wash hands before and after preparing, handling, or sampling foods.

WHAT IS "LOCAL"?

The terms "local" or "regional" are used a lot these days in reference to food. Both words imply close geographic proximity, but what a school or community considers "close" often depends on the unique geography and climate of where it is located, and on the number of agricultural prducers in the area. (For example, a rural school surrounded by agriculture might define local as within the county, while an urban school far from farm lands might define local as within the State or within 200 miles.)

Activity III. Harvest, Prepare, and Taste Dark-Green Leafy Greens! (30 minutes, Health/Garden)

Prepare: *If you have a school garden and have planted dark-green leafy vegetables, such as spinach or leaf lettuce, you can do this activity when they are ready for harvest.* **(p. 104)**

Otherwise, use purchased samples of dark-green leafy vegetables, such as spinach and leaf lettuce. You'll need access to sinks for hand washing and rinsing of the greens. You will also want to supply plates, napkins, and forks for each student. Pour samples of the salad dressings into small bowls. ***Note:*** *The activity is written for two raw samples, but you may want to add a cooked one to compare. (For example,* ***Crispy Kale Chips Recipe*** *(p. 24).) You may want to ask your school district's Food Service Director or a local chef for assistance with this activity.*

1. In this activity, explain that students will harvest *(if growing in the garden)*, prepare, and taste a variety of **dark-green leafy vegetables**. Whether harvesting or purchasing, show and observe spinach leaves with students. Pass leaves around for students to look at, smell, and touch (but not eat!) Explain that spinach, for example, is a green, leafy plant that grows close to the ground. The stems grow straight up from the ground in clusters, and leaves usually grow 6-8 inches long. How can one pick good spinach leaves? Look for green, crisp leaves with a fresh, sweet fragrance, and a springy texture. Avoid limp, discolored, or damaged leaves.
2. Distribute the ***Dark-Green Leafy Vegetable Taster*** handout (pp. 67-68). First, have students try to match the pictures of some dark-green leafy vegetables with their names (for example, spinach, bok choy, collard greens, leaf lettuce, kale, and romaine lettuce).
3. Explain that broccoli and dark-green leafy vegetables, such as spinach, belong to a subgroup within the Vegetables Food Group called the **Dark-Green Vegetables Subgroup**. Vegetables in this subgroup all provide the same kinds of nutrients. Eating vegetables from this subgroup each week helps you play hard and be healthy. (Learn more about nutrients and the vegetable subgroups in Lesson 3 on p. 26.)

4. Go over the ***Spinach Fun Facts*** on the handout. Have students wash their hands carefully, before and again after harvesting, and go over the proper steps found on p. 5. Next, help students harvest greens (if they are growing in the garden) and prepare them for tasting by rinsing them carefully in water, following the appropriate food safety steps (see p. 4). Explain that it is important to follow these food safety steps any time food is being handled or eaten to remove dirt and germs that could make you sick. ***Note:*** *If you do not have access to an appropriate and clean sink for food preparation, or your school policy does not allow children in the kitchen, ask for help from your school's food service staff to rinse the greens.*

5. Now it's time to taste! Remind students of the **Tasting Etiquette Guidelines** *(created in Lesson 1).* Have students first taste each of the dark-green leafy vegetable samples without any dressing and describe it in the designated spaces on their handout noting any differences in taste, texture, color, and appearance.

6. Next, have them taste the greens with a little of each of the dressings provided. They should note their observations on their ***Dark-Green Leafy Vegetable Taster*** handouts.

7. Invite students to describe what they tasted, which they preferred, and to explain why. Ask students to consider the pros and cons of using salad dressings. *(A little salad dressing made with vegetable oils can add flavor to a salad. Too much salad dressing can make your salad soggy, hide the colorful salad ingredients, and make your salad less healthy by adding too many calories.)*

8. Have students finish the activity by answering the questions on their handout in their **Garden Journals**. Ask them to share ideas of how to add dark-green leafy vegetables to their meals.

HOW TO RINSE LEAFY GREENS

Fresh leafy greens can have a lot of dirt trapped in the folds and crevices of the leaves. It is important to rinse them well before eating. Here's how:

1. Fill a large clean bowl with very cold water.

2. Add the greens to the water and gently submerge them. Carefully swish the greens around in the water with your hands.

3. Remove the greens and pour out the used water.

4. Rinse out the bowl to remove any leftover dirt.

5. Refill the bowl with cold water, put the greens back in, and repeat this process until the greens are clean. (You'll know the greens are clean when there is no dirt left in the water.)

ABOUT THE DARK-GREEN VEGETABLE SUBGROUP

It's not enough to be dark green. Some vegetables, like zucchini and cucumbers, are not in the **Dark-Green Vegetables Subgroup.** Zucchini and cucumbers are white inside, not green, and only have a green outer skin/peel. Some "green" vegetables, such as green beans, don't have the same kinds, or amounts of, certain nutrients as those in the **Dark-Green Vegetable Subgroup**.

It's not enough to be a leaf. While most dark-green leafy vegetables are in the **Dark-Green Vegetable Subgroup**, there are other lighter colored leafy veggies that are not. (For example, cabbage, iceberg lettuce, and Brussels sprouts.) They do not have the same kinds and amounts of nutrients as dark-green leafy vegetables.

DARK-GREEN LEAFY VEGETABLES? RAW OR COOKED?

Many dark-green leafy vegetables, such as spinach and leaf lettuce, are eaten raw in salads or on sandwiches. Some leafy greens, such as mustard greens, kale, and collards, are often cooked before eating. Cooking mellows the somewhat bitter flavor of these greens and provides a softer texture than the raw leaves. Ask your school's food service staff or a local chef to demonstrate and offer cooked samples of greens such as kale or mustard greens. (For example, try offering kale chips, sautéed mustard greens, or a soup with kale for students to taste.)

DIG DEEPER! ROCK ON!

Have students create original fruit and veggie songs promoting healthy messages. Students can perform them in the cafeteria, at an assembly, over the morning announcements, or on the local radio station.

Recipe

Crispy Kale Chips

Preparation Time: 15 minutes
Serves: 12
Serving Size: ½ cup

Note: *Check p. 2 for Important Food Safety Steps and Allergy Reminders.*

Ingredients:
- 1 lb kale (1-2 bunches), rinsed and dried
- 2 Tbsp olive oil or vegetable oil
- 2 tsp salt

Supplies:
- 2 baking pans
- spatula

Directions:

1. Preheat the oven to 375 °F.
2. Remove the tough stem from the kale leaves, and cut the leaves into 4- to 5-inch pieces.
3. Toss the kale leaves with oil until they barely glisten. Sprinkle the leaves with salt.
4. Spread the leaves onto a rimmed baking sheet in a single layer. Do not overlap the leaves or they will not get crispy. Bake for 5 minutes. Take the baking pan out of the oven, turn the leaves with spatula, and put the pan back into the oven. Bake for 5-10 more minutes.
5. Check the leaves often. Leaves should be crispy but not burnt. Let chips cool on pan. Enjoy!

REFLECT (30 minutes, English Language Arts)

1. Display the ***Dig In! poster (Leafy Green DJ)*** where students can see it. Have students reflect in their **Garden Journals** on the following questions. *What was the most interesting discovery you made about where your food comes from? What new dark-green leafy vegetable did you taste? What different ways can you include dark-green leafy vegetables in your meals? What dark-green leafy vegetables can you identify in the poster?*

   (Need help? A list of all vegetables pictured in the poster can be found at: ***http://teamnutrition.usda.gov/Resources/dig_in.html****)*

2. As a final assessment, have students write a creative story called "***My (Fruit or Vegetable) Travel Journal***." They will write about the journey from a farm to their plate, from the point of view of a fruit or vegetable. The story should describe their understanding of the food system. Ask: *What does the food experience as it travels from the farm to your table?*

EXTENSIONS

Share Food Travels. Have students take their original stories (from reflection) about a food's travels from the farm to their table, illustrate it fully, and then read their stories to a younger class (grades K-2) to teach them about the food system.

Local. Invite your school district's Food Service Director to talk to the class about how foods for school meals are purchased, and what food, if any, is purchased from local producers.

Farm Visit. Identify local agricultural sources (farm, farmers market, food co-op, or community garden). Take a field trip to discover and identify the variety of fruits and vegetables grown at one of these sources. Have students work in small groups to prepare interview questions for farmers, market managers, or garden caretakers before the trip. If your class is unable to take a trip, invite a local farmer to visit your classroom.

Teacher Handout

THE FARM TO PLATE GAME!

Teacher Instructions:

This game can be played by the whole class or by individual students as an independent activity. There are nine cards *(see p. 66)*, each with a different role* in the food system. Assign a student or group of students to each role. Print out the sheet of cards and cut along the dotted lines. **Tip!** To make them more durable, you may want to print on card stock or laminate.
***Note:** This is not a complete food system list, and some roles may fit in at multiple stages of the system. (For example, there may be several "Food Transporters" which can fit in different stages of the system.) The important thing is to understand that there are stages of the food supply system and what each role fulfills. You may add to the list of roles after researching more details and steps of the food system with your students.*

How to Play:

Objective: To arrange the cards, or students holding the cards, in the correct order to show how food moves from farm to plate.

Independent Play: Shuffle the cards and place them face down on the table. Start a stopwatch/timer and then turn the cards over quickly Arrange the cards in order, showing how food moves from the farm to the table. When finished, stop the stopwatch and record the elapsed time. Check the order of the cards with the answer key. If an error was made, try the game again. Have students try to improve the time it takes to correctly arrange the cards.

Class Play: Designate one student as **The Educated Consumer** to arbitrate all disputes. Shuffle the cards, and then hand a card, face down, to each student or group of students. Start a timer and then have each student turn over his or her card. Students work cooperatively to arrange themselves in a line, showing the correct order in which food moves from the farm to the table. In case of a dispute, students will ask for aid from **The Educated Consumer** to resolve the dispute. When the students are finished, stop the stopwatch and record the elapsed time. Check the order of the cards with the answer key at right. If an error was made, have students try the game again and attempt to improve their time.

ANSWER KEY AND ROLE DEFINITIONS

Order of the *Farm to Plate* Cards:

1) **Farmer (Producer)**
A person/company who grows and harvests food on a farm

2) **Food Inspector**
A person/company who visits farms or processing centers to ensure that foods are grown and processed safely

3) **Food Processor**
A person/company who washes, cuts, mixes, and packages food from the farm

4) **Food Transporter**
A person/company who moves food from one location to another, such as by truck, train, ship, or airplane

5) **Food Distributor**
A person/company who decides which stores receive the food

6) **Advertiser**
A person/company who designs the advertisements that promote food to consumers

7) **Grocer/Food Retailer**
A person/company who sells food to consumers (such as through a grocery store or supermarket)

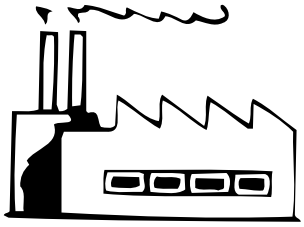
8) **Consumer**
A person who buys the food that has been grown or prepared

9) **Compost/Waste Manager**
A person/company who disposes of leftover food scraps by either composting or throwing food away (sending to a landfill)

The Farm to Plate Game! Playing Cards

Farmer (Producer)

A person/company who grows and harvests food on a farm



Food Processor

A person/company who washes, cuts, mixes, and packages food from the farm

Food Transporter

A person/company who moves food from one location to another, such as by truck, train, ship, or airplane

Food Distributor

A person/company who decides which stores receive the food

Advertiser

A person/company who designs the advertisements that promote food to consumers

Food Inspector

A person/company who visits farms or processing centers to ensure that foods are grown and processed safely

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A person/company who disposes of leftover food scraps by either composting or throwing food away (sending to a landfill)

USDA United States Department of Agriculture

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Dark-Green Leafy Vegetable Taster (Page 1 of 2) LESSON 2 HANDOUT 2

Name: _____ **Date:** _____

The **Vegetable Food Group** has five vegetable subgroups. One of these subgroups is called the **Dark-Green Vegetable Subgroup**. Vegetables in this group all provide the same kinds of nutrients; that's why they are grouped together. To eat smart and play hard, we need to eat dark-green vegetables every week.

Which have you tried? Circle:

spinach **green leaf lettuce** **bok choy** **kale** **broccoli**

Spinach Fun Facts

- Fuel up with spinach to eat smart and play hard. It's packed with vitamin A, which helps keep your eyes and skin healthy. It also contains other nutrients your body needs, such as vitamin C, folate, and the mineral potassium.
- Fresh spinach is a tasty way to make your salad or sandwich a little greener. Thawed frozen spinach is great mixed with tomato sauce for pasta or as a topping on pizza.
- California, Arizona, Texas, and New Jersey grow the most spinach in the United States!
- Recipes with "Florentine" in their name contain spinach, such as "Eggs Florentine."

Dark-Green Leafy Vegetable Taster (Page 2 of 2)

Name: _____ **Date:** _____

Taste

1) Write down and draw the leafy greens you will taste below.

2) Before you taste, write down your observations about each sample.

3) Taste and chew each sample slowly using all your senses. Write down what you taste. You may want to use some of these adjectives to help you: crunchy, sweet, salty, peppery, fresh, earthy, crisp, soft.

Remember your class's **Tasting Etiquette Guidelines!**

1. Dark-green leafy vegetable: _____

Observation (color, texture, size, shape): _____

Taste: _____

Dressing (_____) Taste: _____

Dressing (_____) Taste: _____

Dressing (_____) Taste: _____

2. Dark-green leafy vegetable: _____

Observation (color, texture, size, shape): _____

Taste: _____

Dressing (_____) Taste: _____

Dressing (_____) Taste: _____

Dressing (_____) Taste: _____

Reflect and Create

(Answer the following questions in your **Garden Journals**.)

1) Have you ever eaten any of the dark-green leafy vegetables you just tried at home?

2) What dark-green leafy vegetables have you eaten at school?

3) How could you add dark-green leafy vegetables to your lunch? To your dinner? To a snack?

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Lesson 3: Healthy From the Ground Up

TOTAL TIME REQUIRED: 165 minutes / 3 sessions
Session 1: **Getting Started** 20 min (Health);
Activity I "Seed Race!" 40 min (Science)
Session 2: **Activity II "Veggies: Nature's Rock Stars"** 40 min (Health/Science/Math);
Activity III "Taste the Power of the Bean!" 20 min (Science/Health)
Session 3: **Reflect** 45 min (English Language Arts/ Health)

Key Message:

A lot can happen when you eat your colors. Make half your plate fruits and veggies. They'll help you eat smart to play hard!

Subject Connections:

Science, Health

Learning Objectives:

Students will be able to…

- Describe how both plants and people need nutrients to grow and be healthy.
- Identify nutrients provided by fruits and vegetables.
- Explain the importance of eating a variety of vegetables from all of the vegetable subgroups.
- Identify beans and peas.
- Summarize the health benefits of eating beans and peas.

Supplies:

- Access to sink with warm, running water and soap
- Can opener, large mixing spoon, colander, measuring cup, 2 large serving bowls, bowls, spoons, and napkins for each student
- 6 plastic bags with zipper-style closure, paper towels, pan/tray, 1 680-mg packet of lettuce seeds, bowl, sponge, tape, 1 opaque plastic bag, 1 cup potting soil
- **Garden Journals**
- Student handouts (pp. 69-74):
  1. ***Nutrient Knowledge Flashcards***
  2. ***Case of the Missing Subgroup***
  3. ***A Lot Can Happen When…***
- ***Optional*** (flipbook extension): Colored pencils, blank paper or index cards
- ***Dig In!*** posters – ***Leafy Green DJ, Veggie Rock Stars, Dancing Beans***

Featured Fruits and Vegetables:

Black bean
Provide dry samples of black beans for students to observe and cooked samples of black beans for students to taste (or 2 15-oz cans, rinsed, drained (no salt added). (See recipe on p. 30 to adjust amounts.)

Additional Foods:

Recipe on p. 30 serves 6; adjust as needed: canned whole-kernel corn (no salt added), tomatoes or jar of salsa, 3 cups (1 bag) of baked tortilla chips. Optional: lime juice, cucumber, onion, melon, red bell pepper, and cilantro. Provide water (and cups) for students to drink as they taste the vegetables.

LESSON OVERVIEW:

In this lesson, students learn that people and plants need nutrients to be healthy and grow. They will conduct an experiment observing how seeds grow in various conditions, with and without nutrients, and draw conclusions about their own needs and health. Finally, students will play a game that helps them identify and classify various vegetables and create new, healthy meals.

ESSENTIAL QUESTIONS: *What do living things need to survive, stay healthy, and grow? How do plants and people get their nutrients? What is a nutrient, and where can I find what I need?*

TEACHING PROCEDURE:

GETTING STARTED (20 minutes, Health)

1. Write "Healthy Plants" on one side of the board and "Healthy People" on the other. Start a discussion by asking students how we are similar to and different from plants. Ask students if they can describe what each needs to live and grow. Allow students to share their ideas. Guide student answers to reflect water, air, sunlight, and food for both plants and people. Ask students if there are other things people might need to be healthy (for example, physical activity, sleep).

2. Explain that we need nutrients, just like plants do. **Nutrients** are the substances in food that plants and people use to grow and be healthy. What are the six nutrients people need? (***Carbohydrates, Proteins, Fats, Vitamins, Minerals,*** *and* ***Water***) Explain that some nutrients give the body energy – which we use for body processes, like digestion and breathing, as well as for physical activity, like running and jumping. Nutrients that give us energy are carbohydrates, proteins, and fats. Vitamins and minerals are nutrients that do not provide energy, but have other roles that help the body grow and stay healthy (for example, help our skin stay healthy or our teeth stay strong).

3. Ask: *Where do plants and people get nutrients?* Plants get their "food" nutrients from the soil in which they grow. They also make their food through **photosynthesis** – a process by which the plant makes food energy from sunlight. People get the nutrients they need by eating a *variety* of foods – from plants (fruits, vegetables, grains, nuts, and seeds) and animals. Fruits and vegetables provide many important nutrients people need to be healthy and grow.

4. Explain and summarize the connection that healthy plants have to healthy people. Healthy edible plants provide food that gives people nutrients they need to live and grow.

LEARNING ACTIVITIES

Activity I. Seed Race! (40 minutes for experiment; 5 days of observation, Science)

Prepare: *Set up a station in the classroom where student groups can work on observing a seedling race. Provide materials: pan/tray, plastic bags with zipper-style closure, lettuce seeds, container filled with water, cup of soil, sponge for spills, tape, paper towels. You will conduct the experiment as a demonstration for students to observe. Prelabel six bags with "Condition 1" through "6" as listed below.*

1. Explain that the class will conduct a seedling race to investigate how plants respond to different conditions in order to understand how access to nutrients affects their health and growth. Ask students to have their **Garden Journals** ready to write down their predictions, observations, and conclusions. Show students the materials you have assembled. Let them know that you will be creating six different growing conditions for the seedlings. ***Note:*** *Explain what you are doing every step of the way during the experiment. Invite a different volunteer to help with the setup of each condition. After each step, ask students to raise their hands if they think the seed will grow. Keep track of their predictions on a chart. Ask students to explain why they think the seed will or will not grow. A lettuce seed is about half the size of a grain of rice. Each 680 mg lettuce seed packet contains approximately 800 individual seeds. For each condition, you will need a "pinch" of seeds – about 10-15 seeds. The paper towels give the seeds a surface to hold on to. For Conditions 1-4, keep the plastic bags open. For those conditions that use water, place them in a bowl or cup to keep them stable. Place the experiments on a tray near a window with natural light.*

Condition 1: Place a paper towel in a bag with a pinch of seeds.

Condition 2: Place a paper towel in a bag, add seeds, and fill bag ¾ full with water.

Condition 3: Place a paper towel in a bag, add seeds and soil, but no water.

Condition 4: Place a paper towel in a bag, add seeds, soil, and 2 Tbsp water.

Condition 5: Place a paper towel dipped in water in a bag, add seeds, press the bag from the bottom to the top to release all extra air, and then seal shut so all extra air and space are limited.

Condition 6: Place a paper towel dipped in water in a bag, add seeds, and then cover bag with a larger opaque plastic bag that will not allow light to come through.

Teacher Tip! *Lesson 4 offers an opportunity to study and discuss what plants need to survive, stay healthy, and grow with a plant growing experiment and discussion of tropisms (see pp. 33-34).*

SEEDLING RACE FLIPBOOKS (SCIENCE)

Students can make flipbooks animating the seedling experiment! Have students draw their observations each day using colored pencils on blank paper or index cards. Drawings should be approximately the same scale and in the same location on the card each time. Instead of having students draw each of the six seedling conditions, designate one condition of the experiment to every student. Have them create a cover with "Seedling Race," their name, the experiment conditions, and date on it. Staple on the left, flip through, and see the seeds grow!

GARDEN TEAM TASK

Send out your garden teams with hand shovels and plastic cups to gather soil samples from the garden, or possible garden sites, to observe what is in soil. Provide students with magnifying glasses to look at the soil more closely. Encourage them to observe and note the color, shapes, and size of particles. What do they notice? Let them help you collect samples from your garden plot/location for soil testing. **(pp. 94-95)** Explain that soil testing can measure pH (soil's acidity and alkalinity) and determines if there is too little or too much of a nutrient (such as calcium or magnesium) in the soil. This information helps growers know whether and how much fertilizer or compost to add to the soil so the plant will have the nutrients it needs to grow. When plants are growing, they take nutrients out of the soil. Over time, nutrients must be added back to the soil so that the garden or farmland will continue to support healthy plants.

WHAT'S IN HEALTHY SOIL?

Soil is not just dirt. Healthy soil is loaded with nutrients! If plants don't get all the nutrients they need from the soil, they will likely have discolored or poorly formed leaves and will not form fruits well. Here is just a sampling of what is found in healthy soil:

Nitrogen:
needed for healthy leaf growth

Phosphorus:
helps roots grow

Potassium:
helps the flowers and fruits grow

Calcium:
helps build plant cell (basic structural and functional unit of all organisms) walls

Magnesium:
helps in photosynthesis (the process by which plants turn sunlight into food)

Sulfur:
helps form chlorophyll (the green pigment in plants that absorbs light)

Healthy soil also has decomposers (living creatures such as fungi, bacteria, earthworms, lichen) that break down dead plant material to release nutrients back into the soil. Rocks, made up of different minerals, are also found in soil and contribute to soil quality as they break down. (pp. 94-95)

Teacher Tip! *Display the* ***Dig In!*** *posters (Leafy Green DJ, Veggie Rock Stars, Dancing Beans). These posters feature vegetables from the* ***Dark-Green****,* ***Red and Orange****, and* ***Beans and Peas*** *subgroups, respectively. How many can your students identify? For a complete list of all the vegetables in each poster, go to:* **http://teamnutrition.usda.gov/Resources/dig_in.html**

2. *Ask: Which seedling will sprout and grow the most? Which will be the "healthiest"?* Have students make a chart across two pages in their **Garden Journals** with the left-hand column labeled 1-6, and space to write down the six conditions of the experiment. They should write their predictions next to each in the next column, along with their reasoning. They will then create five more columns labeled "Day 1," "Day 2," "Day 3," and so on. Each day, they will observe the seedlings, write their observations and make a sketch *(see sidebar on p. 27 for flipbook activity)*. ***Note:*** *Students should ideally observe the experiment at the same time each day. You may also need to add water to the conditions that require water if it has evaporated.*

3. One week later, review the results of the experiment. Have students write their final observations and sketches of each condition. Then, lead a discussion by asking: *How do the results match up to their predictions? Which seedling grew the most? What can they conclude based on this experiment? What do plants need to grow, be healthy, and survive? (Nutrients – water, air, space, food, light.)*

Activity II. Veggies: Nature's Rock Stars! (40 minutes, Health/Science)

1. Now that students have seen what plants need to grow and be healthy, ask students to think about what their bodies need to grow and be healthy. Explain that eating foods from the five food groups provides the **nutrients** the body needs. ***MyPlate*** reminds us to make half our plates fruits and vegetables because they provide many important nutrients for the body. Distribute the **Nutrient Knowledge Flashcards** (pp. 69-71). Give students time to cut, fold, and tape each flashcard. Have students quiz one another using the flashcards, then discuss the terms as a class.

2. Explain that different vegetables have different nutrients. To help people get all of the nutrition they need, nutritionists have divided the **Vegetable Group** into five subgroups. Identify each vegetable subgroup by writing them on the board: **Dark-Green Vegetables, Red and Orange Vegetables, Beans and Peas, Starchy Vegetables**, and **Other Vegetables**. Explain that eating a variety of vegetables from all of five subgroups during the week helps give the body the nutrients it needs. Share the key message with students (p. 26).

3. Ask: *Why aren't all green vegetables in the* ***Dark-Green Vegetable Subgroup****?* Explain that some of the "Other" vegetables, like zucchini and cucumbers, are different from **Dark-Green Vegetables** because they are not green inside – they are white inside and only have a green outer skin or peel. Vegetables in the **Other Vegetables Subgroup** are also lower in certain nutrients than **Dark-Green Vegetables**. For instance, green beans are lower in vitamins A, C, and folate than most **Dark-Green Vegetables**.

4. Why aren't beets (the roots) in the **Red and Orange Vegetable Subgroup**? Beets are different because those that are most commonly available are a purplish color, which is different from the red seen in red peppers or the orange in carrots. Beets are also lower in some nutrients than **Red and Orange Vegetables**, such as vitamins A and C. Therefore, because of the color and nutrients they provide, beetroots are part of the **Other Vegetable Subgroup**. ***Note:*** *The green leafy tops of beets can also be eaten. These beet greens are in the* ***Dark-Green Vegetable Subgroup.***

5. Finally explain that **beans** and **peas** are special. Why? Because they fit into TWO food groups: the **Vegetable Group** and **Protein Foods Group**. First, ask students if they have ever heard the word "**legumes**." Beans and peas are sometimes called legumes *(plants that bear their fruit in seed pods).* Explain that beans and peas contain various nutrients such as vitamins and minerals, but they also contain **protein**, which helps the body build strong muscles, bones, blood, and skin.

   What veggies are part of the **Beans and Peas Subgroup**? Why aren't green (string) beans and green peas in the **Beans and Peas Subgroup**? Green peas have similar nutrients to other starchy vegetables. Therefore they are grouped within that subgroup. Green beans are in the "other" vegetable subgroup. Vegetables found in the **Starchy** and **Other Subgroups** are still healthful choices. In fact, eating vegetables from all the subgroups helps you get the nutrients you need to play hard and be healthy.

6. Lead a discussion by asking students the following questions: *Did you know that very few Americans eat enough fruits and vegetables, especially dark-green, red and orange vegetables, and beans and peas? How often do you eat these vegetables? What vegetables do you eat from the vegetable subgroups?*

7. Provide students with the ***Case of the Missing Subgroup*** handout (pp. 72-73). Explain that the handout features a sample weekly school lunch menu, but it's missing a vegetable subgroup. Ask students what subgroup is missing (*Dark-Green Vegetables*), and to identify ways to include a vegetable from the missing subgroup on the menu. Students can work alone or in pairs. Invite them to share their answers with the class and discuss different possibilities.

ANSWER KEY: *Case of the Missing Subgroup handout*

Missing Subgroup: Dark-Green Vegetables. Vegetables from the remaining subgroups include:

Other: iceberg lettuce, zucchini, cauliflower

Starchy: corn, green peas

Beans and Peas: baked beans

Red and Orange: sweet potatoes, carrots, tomatoes (on pizza)

Solutions to complete the menu *(more than one answer possible)*: Use romaine lettuce or spinach in the salad on Thursday or serve broccoli instead of corn on Wednesday.

ADDITIONAL EXAMPLES OF VEGETABLES FOUND IN EACH SUBGROUP ARE:

Dark-Green Vegetables: leaf lettuce, collard greens, kale, Swiss chard, bok choy

Red and Orange Vegetables: pumpkin, acorn squash

Beans and Peas (these also fall under **Protein Foods Group**): split peas, pinto beans, kidney beans

Starchy Vegetables: potatoes, jicama, plantains

Other Vegetables: artichoke, asparagus, cucumber, eggplant, Brussels sprouts, mushrooms

See more examples in each vegetable subgroup: http://www.choosemyplate.gov/food-groups/vegetables.html

DO FRUITS HAVE SUBGROUPS?

Fruits do not have subgroups, but it's important to eat different kinds of fruits during the week. Melons, citrus fruits, berries, apples, peaches, and bananas are just a few of the many delicious choices.

DIG DEEPER! (MATH/HEALTH)

For an extra challenge, and applied Mathematics, ask students to graph the nutrient content of different vegetables, such as 1 cup of iceberg lettuce, 1 cup of raw spinach, ½ cup cooked black beans, ½ cup cooked corn, and ½ cup raw carrots (***Note:*** *1 cup of raw leafy greens counts as ½ cup of vegetables)*. Using the U.S. Department of Agriculture's online **SuperTracker Food-a-Pedia** (**https://www.supertracker.usda.gov/foodapedia.aspx**), have students look up the amount of: protein, vitamin A, vitamin C, fiber, folate, and potassium for each vegetable. A brief video tour on how to use Food-a-Pedia is available at **https://www.supertracker.usda.gov/sitetour.aspx** (see Section 4 of the User Guide). Ask students to create a separate bar graph for each nutrient. (For example, one graph will show the grams of protein for lettuce, raw spinach, black beans, etc.) What do these findings reveal about the importance of eating a variety of vegetables?

Activity III. Taste the Power of the Bean! (20 minutes, Science/Health)

Prepare: *Set up preparation and tasting stations for students to make a rainbow bean salsa recipe. For every six students, provide: a large mixing bowl, large spoon, and the ingredients and amounts listed in the recipe below. You can provide more chopped vegetables from the garden, or even fruit, for additional color and flavor, such as: red pepper, cucumber, onion, melon, squeezed lime, and cilantro. Open cans and rinse, drain, and place canned vegetables in bowls for students prior to activity. Provide individual bowls, spoons, and napkins for tasting.*

1. Tell students they will prepare and then taste a rainbow black bean salsa featuring colorful vegetables. First ask students to tell what beans they eat the most and how they normally eat them. Ask students to consider including more beans and peas in their diet: *Do you have any favorites? How do you eat them? (Cooked as a side dish, in a chili, cold in a salad, etc.?) What are the different ways beans are sold in a store? (Dry, canned, frozen.) What beans have you tried?*
2. Pass around dry black beans. Let students each take one to touch and observe. Ask if anyone can think of what plant part this comes from *(seed)*. Tell students that black beans can be found year-round in most places and can be purchased dried or canned. India and Brazil grow the most beans worldwide, while North Dakota, Michigan, and Nebraska are the top bean producers in the United States.* Which beans are growing, or could be growing, in the garden? *(****Sources:*** *Food and Agricultural Organization of the United Nations,* ***http://www.fao.org****; USDA Economic Research Service,* ***http://www.ers.usda.gov/topics/crops/vegetables-pulses/dry-beans.aspx****)*
3. Have students wash their hands following proper procedures (see p. 5). Instruct students to mix beans, corn, and salsa (and any extra ingredients) in a large bowl. Next, provide each student with a bowl, a spoon, and napkins to sample the salsa with tortilla chips.
4. Have students take notes on the taste in their **Garden Journals**. What do you like about it? Why? Ask: *What other ingredients could we add to the salsa? What other kinds of salsa have you tried?*

IMPORTANT FOOD SAFETY STEPS!

Please see p. 4 for a reproducible handout to post in a visible location in your classroom. It is important that you follow these steps to keep yourself, your students, and any parents or volunteers safe and healthy.

Hand Washing:
All persons participating in the food preparation activity (teachers, students, volunteers, parents) should wash hands before and after preparing, handling, or sampling foods.

Allergy Alert! *See p. 2 for more information on food safety and allergies before starting this food preparation activity.*

Recipe Rainbow Bean Salsa

Preparation Time: 15 minutes **Serves:** 6
Serving Size: ½ cup salsa and ½ cup baked chips

Ingredients:
- 1 15-oz can black beans, drained and rinsed
- 1 11-oz can corn (no salt added), drained
- 1 cup salsa or 4 tomatoes, chopped
- 1 red bell pepper, chopped (optional)
- 1 cucumber, chopped (optional)
- 1 onion, chopped (optional)
- 1 cup melon, chopped (optional)
- 2 Tbsp cilantro, chopped (optional)
- 2 tsp fresh lime juice (optional)
- 3 cups baked tortilla chips

Supplies:
- large bowl
- large spoon
- colander
- measuring cups

Directions:
1. In large bowl, mix together all ingredients except for tortilla chips.
2. Serve with chips to dip. Enjoy!

REFLECT (45 minutes, English Language Arts/Health)

1. By now, students have learned that eating a variety of vegetables can give their bodies the nutrients they need to grow, play hard, and stay healthy. Ask students why they might want to vary their vegetables. *(Eating a variety will give their body different nutrients to grow and stay healthy. It also adds different flavors, textures, and colors to the plate, making meals and snacks more interesting.)*

2. Distribute the handout ***A Lot Can Happen When…*** (p. 74) and read through the instructions with the class. Explain that they will now create an original story in the form of a comic strip finishing the sentence, "A lot can happen when…" Tell them to use the questions to help them brainstorm and begin their visual stories. Ask: *What do you wish could happen to you in a day? What is one of your biggest goals? What is an obstacle you would like to overcome?* Explain that they must use at least one vegetable from the subgroups they have learned about in this lesson. Suggest that they use the vegetables as characters, props, or in the plot of their story. Encourage them to be creative!

Give them 20-30 minutes to write and illustrate their stories, and then ask students to share with the rest of the class.

3. Ask students to continue reflecting in their **Garden Journals** on the following questions: *What was the most surprising thing you learned in this lesson? What new vegetables will you try this week? Each day?* Encourage them to think about ideas for breakfast, lunch, snacks, and dinner.

EXTENSIONS

Veggies in Our Lunch. Did you know that schools participating in the National School Lunch Program are required to offer vegetables from each of the five subgroups (**Dark-Green, Red and Orange, Beans and Peas, Starchy, Other**) in their lunches over the course of the week? Have students analyze the school lunch menus to identify vegetables from each subgroup. If your school lunch menu doesn't list the specific vegetables offered (for example, on a salad bar), ask your school district's Food Service Director for this information.

Analyze Theirs. Collect menus from local restaurants and have students analyze them to determine which menu features the most vegetables from the subgroups. Have students collect data, then graph it. Can they identify healthy and balanced local meal options?

Grow Your Nutrients. Determine which vegetables from the subgroups are growing in the garden. Are there any that you and your students want to add to the garden?

LOOK! IT'S A VEGETABLE! IT'S A PROTEIN! IT'S A SUPERBEAN!

Beans and peas are the rock stars of the garden. They are low in fat, high in fiber, and packed with plant protein. They provide nutrients such as iron and zinc. This makes them similar to meats, poultry, and fish – which is why they are also part of the **Protein Foods Group**. Here are a few of the most popular beans and peas: kidney beans, pinto beans, black beans, black-eyed peas, chickpeas (garbanzo beans), split peas, and lentils. They are available in dry, canned, and frozen forms. Do you know all of them? Try a new one!

Nutrient Knowledge Flashcards (Page 1 of 3) LESSON 3 HANDOUT 1

Name: _____ **Date:** _____

What is a nutrient?
Nutrients are the substances in food that help us grow, play hard, and stay healthy. Eating a variety of vegetables not only keeps meals interesting, but also helps the body get the nutrients it needs to be healthy. That's because different veggies have different amounts of vitamins, minerals, fiber, and protein. Eating from all five of the ***MyPlate*** vegetable subgroups each week helps us get the variety we need: **Dark Green Vegetables**, **Red and Orange Vegetables**, **Beans and Peas, Starchy Vegetables**, and **Other Vegetables**.

Cut out, fold, then tape or glue edges of flashcards together. Use them to test your knowledge about nutrients in fruits and veggies. Then quiz your friends and family!

Clues
- Helps protect my eyes and skin
- Found in dark-green veggies (like spinach and kale), red and orange fruits and vegetables (like carrots, cantaloupe, sweet potato, and tomatoes)

(Vitamin)
Vitamin A

Clues
- Helps my body heal cuts and scratches
- Keeps my teeth and gums healthy
- Found in fruits and veggies like oranges, grapefruits, kiwi, tomatoes, strawberries, bell peppers, potatoes, and broccoli

(Vitamin)
Vitamin C

Clues
- Helps my body form red blood cells
- Found in dark-green veggies (especially spinach), asparagus, Brussels sprouts, beans and peas, and oranges

(Vitamin)
FOLATE
(Also known as "Folic Acid")

FOLD

Nutrient Knowledge Flashcards (Page 2 of 3)

Name: _____ Date: _____

Clues

- Keeps my muscles and nervous system working right
- Helps my body keep a normal heartbeat and blood pressure normal
- Found in fruits and veggies like bananas, dried apricots, cantaloupe, orange juice, sweet potatoes, white potatoes, white beans, kidney beans, tomato sauce, and spinach

(Mineral) Potassium

Clues

- My body uses it to carry oxygen from my lungs to the rest of my body
- Vitamin C helps my body absorb (take in) more of it
- Found in dried fruits (like raisins), beans and peas, and dark-green leafy vegetables (like spinach)

(Mineral) Iron

Clues

- Gives me energy to run, jump, dance, and even blink my eyes
- Found in all fruits and veggies

Carbohydrate

FOLD

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Name: _____ Date: _____

Clues

- A type of carbohydrate that my body cannot digest, but has many overall health benefits
- May lower my risk of heart disease and diabetes
- Keeps food moving through digestive tract, and helps me feel full after eating
- Found in most fruits and vegetables. Juicing and peeling lowers the amount of it in fruits and veggies.

Fiber

Clues

- My body uses this to build healthy muscle, skin, bone, and tissue
- Also used for energy
- Found in beans and peas

Protein

Clues

- Provides energy and helps my body absorb (take in) certain vitamins
- Liquid forms, like oils from avocados and olives, are heart healthy and provide some vitamins.
- Solid forms (at room temperature), like butter and stick margarine, may be added when foods are prepared. Eating too much solid fat is not good for my heart.

Fats

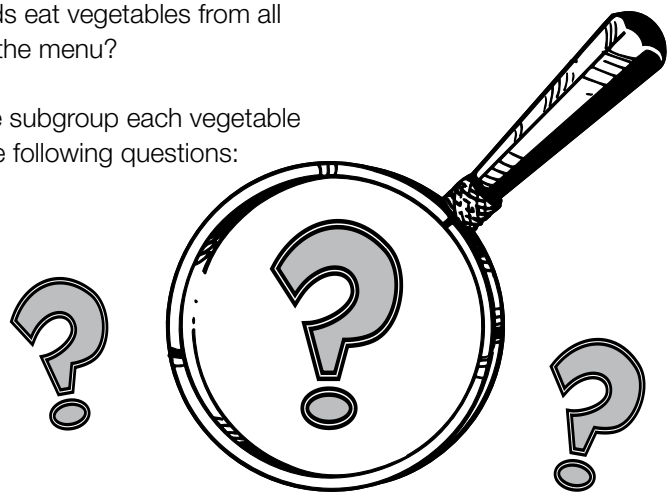
FOLD

Case of the Missing Subgroup

Name: _____ **Date:** _____

The school lunch menu for the week has just been posted. But it's missing a vegetable subgroup! You now know how important it is to make sure you and your friends eat vegetables from all of the subgroups each week. Can you help complete and improve the menu?

Using the list of vegetables in each subgroup, write the name of the subgroup each vegetable belongs to on the space provided. Study the menu, and answer the following questions:



- How often is each vegetable subgroup on the menu?

  Dark Green: _____

  Red and Orange: _____

  Beans and Peas: _____

  Starchy: _____

  Other: _____

- Which subgroup is missing? _____

- What change could you make so that kids could get all the subgroups during the week? _____

_____

_____

_____

Tip! Remember, most people don't eat enough red, orange, and dark-green vegetables, and beans and peas — so try to include these in meals and snacks as often as you can.

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Case of the Missing Subgroup (Page 2 of 2)

LESSON 3 HANDOUT 2

Name: _____ **Date:** _____

WEEK 1 – SCHOOL LUNCH MENU

MONDAY:
Roast Pork
Steamed Brown Rice
Glazed Sweet Potatoes
(Name of Subgroup:

_____ ***)***

Fresh Grapes
Fat-free Milk

TUESDAY:
Ground Beef & Macaroni
Whole-Wheat Roll
Steamed Fresh Zucchini
(Name of Subgroup:

_____ ***)***

Banana
Apple Crisp
Fat-free Milk

WEDNESDAY:
Chicken Salad
Whole-Wheat Bread
Cauliflower
(Name of Subgroup:

_____ ***)***

Corn
(Name of Subgroup:

_____ ***)***

Fresh Strawberries
Fat-free Milk

THURSDAY:
Baked Cajun Fish
Cornbread
Baked Beans
(Name of Subgroup:

_____ ***)***

Iceberg Lettuce Salad
(Name of Subgroup:

_____ ***)***

Italian Dressing
Apricot Halves
Fat-free Milk

FRIDAY:
Cheese and Tomato Pizza
with Whole-Grain Crust
(Name of Subgroup:

_____ ***)***

Green Peas
(Name of Subgroup:

_____ ***)***

Baby Carrots with Low-fat Dip
(Name of Subgroup:

_____ ***)***

Peach Slices
Fat-free Milk

VEGETABLE SUBGROUP GUIDE (not a full list):

Dark-Green Vegetables:
bok choy
broccoli
collard, turnip, or mustard greens
dark-green leaf lettuce
kale
romaine lettuce
spinach

Red & Orange Vegetables:
acorn squash
butternut squash
carrots
red and orange bell peppers
sweet potatoes
tomatoes

Beans & Peas:
black beans
black-eyed peas (mature, dry)
chickpeas (garbanzo beans)
kidney beans
lentils
navy beans
pinto beans
split peas

Starchy Vegetables:
corn
green peas
plantains
potatoes
water chestnuts

Other:
asparagus
avocado
beets
Brussels sprouts
cabbage
cauliflower
celery
cucumbers
green beans
green bell peppers
iceberg (head) lettuce
zucchini

DO FRUITS HAVE SUBGROUPS?

Fruits do not have subgroups, but it's important to eat different kinds of fruits during the week. Melons, citrus fruits, berries, apples, peaches, and bananas are just a few of the many delicious choices.

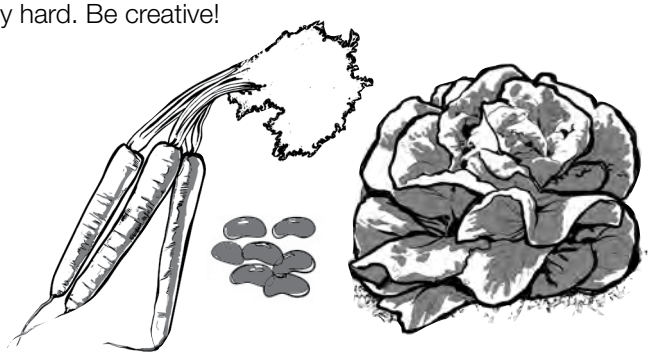
A Lot Can Happen When...

Name: _____ **Date:** _____

You've now learned that different vegetables have different nutrients. Eating a variety of vegetables from each of the five subgroups can help you grow, play hard, and stay healthy! Now it's your chance to turn all that you have learned into a comic strip, titled "***A Lot Can Happen When...***" Mention at least one vegetable from one of the five vegetable subgroups in your comic. Tell how eating a colorful variety of vegetables helps you play hard. Be creative!

Use the questions below to help you get your visual story started:

- **What do you wish could happen to you in a day?**
- **What is an obstacle you'd like to overcome?**
- **What is one of your biggest goals?**



A Lot Can Happen When...

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Lesson 4: Seeking Out What We Need

TOTAL TIME REQUIRED: 120 minutes / 3 sessions
Session 1: **Getting Started** 10 min;
Activity I "A-Maze-ing Light" 40 min, 2 weeks observation (Science)
Session 2: **Activity II "Seeking Out What We Need"** 40 min (Science/Health)
Session 3: **Activity III "Tasty Broccoli"** 20 min (Health);
Reflect 10 min

Key Message:
Make half your plate fruits and vegetables. They'll help you be your best at school and at play.

Subject Connections:
Science, Health

Learning Objectives:
Students will be able to…

- Demonstrate an understanding of the scientific method by making hypotheses and drawing conclusions based on their own discoveries.
- Identify sources of fruits and vegetables in their school and home environment.
- Describe ways they can add more fruits and vegetables to their meals each day.

Supplies:
- For plant maze (per group of 3 students): pole bean seeds, small planting container, soil, cardboard box with lid/cover (shoebox), scraps of cardboard to build maze walls, tape, scissors, colored markers, illustration of sample mazes
- Access to sink with warm, running water and soap
- Access to a food preparation sink for rinsing broccoli
- Poster board and art supplies
- **Garden Journals**
- Student handouts: (pp. 75-77)
  1. ***A-Maze-Ing Light***
  2. ***Fuel Up With Veggies... Zoom to the Finish!***
- ***Dig In!*** posters – ***Race Car, Video Game***

Featured Fruits and Vegetables:
Broccoli
Provide enough raw samples for students to observe and taste, either from the garden or purchased from a market. Provide water (and cups) for students to drink as they taste the vegetables.

Additional Foods:
Dressings or dips (for example, hummus, balsamic vinaigrette, or ranch dressing) – enough for each student to dip broccoli into each.

LESSON OVERVIEW:

In this lesson, students discover how plants respond to their environment and seek out what they need to grow. Students then apply this learning to their own lives as they search for sources of vegetables at school and home. Additionally, students take part in a class challenge: fueling up with a variety of fruits and vegetables … in a race to the finish.

ESSENTIAL QUESTIONS: *What do living things need to survive, stay healthy, and grow? How can I seek out what I need?*

TEACHING PROCEDURE:

GETTING STARTED (10 minutes)

1. Ask students: *What do plants need to grow and survive? How do plants and people seek out what they need to grow and be healthy?* Have them answer in their **Garden Journals** using complete sentences. Invite them to share their answers. Remind them of what they learned in Lesson 3, that plants and people need **nutrients** to live, grow, and be healthy. People can get what they need by eating a variety of fruits and vegetables from each of the vegetable subgroups. Most people need to eat more from the **Dark-Green, Red and Orange,** and **Beans and Peas** vegetable subgroups.

2. Explain to students that they will do an experiment showing how plants respond to their environment. This experiment will help students transfer their understanding of plant growth, to their own nutritional needs, and how they can seek out what they need.

Activity I. A-Maze-ing Light
(40 minutes preparation, 2 weeks observation, Science)

Preparation (2 weeks in advance): *First, decide how many mazes your class will create. Divide your class into groups of at least three students per maze. For each maze, plant two bean seeds per planting container. Plant one container for you to use as a "Control Bean Plant" (see sidebar). If both seeds in each container germinate, select the strongest seedling, and pull out the weaker seedling. Then, about 4 days before your students begin their observations, place the Control Bean Plant near a windowsill, so that it will begin to grow towards the sunlight. Make sure seedlings are well watered before they are placed in their mazes. Take care not to overwater or the roots will die without enough oxygen in their boxes.*

1. Distribute the handout ***A-Maze-ing Light*** (p.75) to each student, and then divide the class into groups of four to five. Read through all instructions and steps. Ask: *What do you think plants need to grow?* (*Sunlight, water, healthy soil, air/carbon dioxide*) *Do you think plants change their growth to follow the sun?* Show students the Control Bean Plant. Ask: *What do you observe about this plant? (It is growing towards the sunlight.) What do you think would happen if we moved the plant? What do you think would happen if we blocked the sunlight somehow?* Have students write down their hypotheses in their **Garden Journals**.

2. Explain to students that they are going to design and build a plant maze to test how plants respond to sunlight and their environment. Give each group the materials required *(cardboard box with lid, cardboard pieces, tape, scissors, potted seedling*). Assure students that the mazes do not need to be complicated to test the hypothesis that plants grow towards light. ***Note:*** *The more complicated the maze, the longer it will take for the bean plant to grow.*

3. Give students 20 minutes to build their mazes. After students have completed them, have them place their bean plant, after watering, inside the box. Then position them so that sunlight will shine into the hole in the box. Have students record their predictions in their **Garden Journals**. Ask: *What do you think your plant will do in the next week? Two weeks?*

4. Have students observe, measure, and record their plant's growth in their **Garden Journals** each day. They should also check to see if their plant needs water (by lifting lid of cardboard box carefully). If the soil is dry to the touch, they should add a little bit of water. At the conclusion of the experiment, have students record whether their original hypothesis was correct or incorrect, and in what way. Ask: *Were you surprised by your results? What other factors could you add to this experiment to further test your hypothesis? (For example, they could change the location of the hole where the light enters the maze after 1 week, or cover the hole so that no light enters the maze.)*

Teacher Tip!

USING A "CONTROL" IN AN EXPERIMENT

Explain that the "control" in the experiment is a plant that is grown outside of the maze. This plant is not being affected by the conditions in the maze. By comparing a plant grown in the maze to the control plant, you can see which changes the maze environment may have caused. If the control plant and maze plant are affected in a similar way (for example, both plants wilt), then something other than the maze environment likely caused the change (*such as too little water).*

DIG DEEPER! (SOCIAL STUDIES)

Explore how humans and animals seek out what they need to survive.

Have students work in pairs to research an ancient civilization. Ask them to investigate why they believe people settled where they did. *How were they seeking out what they needed?* (For example, many civilizations would settle near a water source for drinking and to irrigate crops. *Why would other civilizations settle in the mountains? How did they access food and water?).*

Discuss the topic in more depth by asking students to think about: What challenges did ancient civilizations have? Are any of these challenges similar to ones we as a modern society have?

To explore this topic further, see Lesson 6 (p. 42) for more activities on what foods are grown around the world.

GARDEN TEAM TASK

Get your garden teams to evaluate the conditions of the plants growing in the garden. Are plants getting what they need? Do they need more light or water? Do they need pruning or more space? Are there weeds that need to come out? Are there additional plants you want to add? Have garden teams sprout seedlings indoors for new plants to add to the garden. Once seedlings have sprouted, have students work together to transplant them into the garden. (p. 102)

Teacher Tip!

Use this activity as an introduction into the topic of ***tropisms*** *– how plants can change their growth in response to their environment. Plants can show four types of tropisms:*

1. ***Phototropism –*** *the way a plant grows or bends in response to light*
2. ***Geotropism –*** *the way a plant grows or bends in response to gravity*
3. ***Hydrotropism –*** *the way a plant grows or bends in response to water*
4. ***Thigmotropism –*** *the way a plant grows or bends in response to touch*

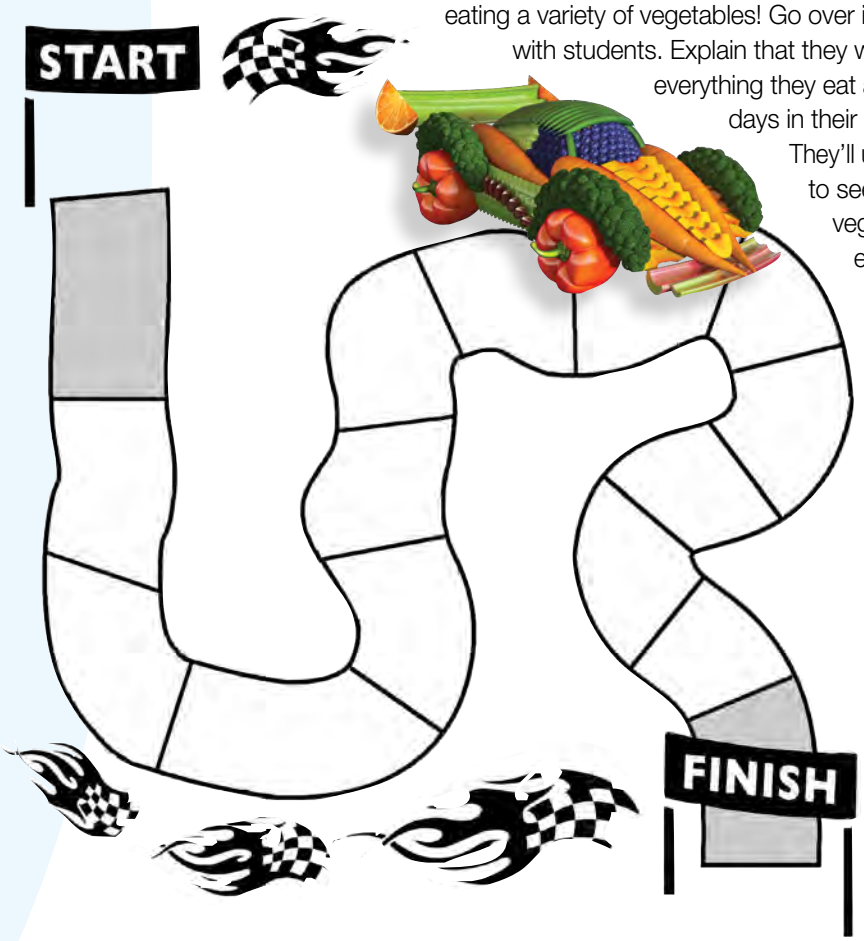
Activity II. Seeking Out What We Need (40 minutes, 3-day tracker, Science/Health)

Pacing Note: *In this activity, students will track and assess what they eat for 3 days. It is recommended that you introduce this activity on a Monday, and then wrap up on a Friday.*

1. Ask students to reflect on what they discovered about plants from their experiment, and write their reflections in their **Garden Journals**. What do plants need to grow and stay healthy? Plants need **nutrients**, which they get from water, sunlight, air (carbon dioxide), and soil. They also need space to grow. *What do plants do when there is a barrier between them and the light they need?* Explain that as they saw in their experiment, plants seek it out by growing towards the light. This is called **phototropism** (see sidebar).

2. Ask students: *What happens to a plant that does not get quite enough sunlight?* Explain that it may not grow as large or produce as many flowers, leaves, or fruit. Sunlight helps plants turn their food into energy – this is called **photosynthesis**. Ask students: *How do we get our energy? (From food, specifically from eating a balanced variety of foods from the five food groups.)* Ask students: *How can you seek out what you need to grow and be healthy? How can you eat more vegetables?*

3. Distribute the ***Fuel Up With Veggies . . . Zoom to the Finish!*** handout (pp.76-77). Explain that their challenge is to zoom across the finish line by eating a variety of vegetables! Go over instructions with students. Explain that they will write down everything they eat and drink for 3 days in their **Garden Journals**. They'll use this information to see how many vegetables they've eaten, and if they included vegetables from the **Dark-Green**, **Red and Orange**, and **Beans and Peas Vegetable** subgroups.



4. Tell students that their race car will move an extra space if they try a vegetable they have never eaten before. Explain that they need to eat a vegetable from the **Dark-Green, Red and Orange**, and **Beans and Peas Vegetable Subgroups** in order for their race car to cross the finish line.

5. Have students respond to the following prechallenge questions in their **Garden Journals**:
   - *How many different vegetables do you think you eat per day?*
   - *What new vegetables do you want to try? (Especially from the **Dark-Green**, **Red and Orange**,* and ***Beans and Peas Vegetable** subgroups.)*
   - *What are some ways you can add vegetables to your meals?*

6. Check in with students each day to see how they are doing. After 3 days, have students identify the vegetables they ate and sort them into their vegetable subgroup. Then, ask students to determine how far their car will move along the racetrack based upon the vegetables they ate:
   - For each vegetable portion eaten, move one space. They may only count one kind of vegetable once per day. (For example, if on Day 1 they have broccoli at lunch, carrots as a snack, broccoli again and eggplant with dinner, they move three spaces.)
   - For each **NEW** (i.e., tried for the first time) vegetable eaten, they get a "**Turbo Boost**" and move ahead one extra space. Students can simply taste a vegetable they have never eaten to get the point. (For example, if they had never tried eggplant, they would get an extra "turbo" point for tasting eggplant. Therefore, on Day 1, they may move four spaces around the racetrack.)
   - They may not cross the finish line unless they have eaten at least one vegetable from each of the following vegetable subgroups: **Dark-Green**, **Red and Orange**, and **Beans and Peas**. (For example, even if they have eaten enough vegetables to move through all spaces on the racetrack, but have not eaten any vegetables from the **Beans and Peas Subgroup**, they may not yet cross the finish line.)

Teacher Tip! *Remind students that eating vegetables from every subgroup can help them be their best, just as they are helping their car zoom across the finish line.*

7. Ask: *Who zoomed across the finish line first? How many different vegetables did the entire class eat?* Have students evaluate the results of the challenge by answering these post-challenge questions in their **Garden Journals**:
   - *How many different vegetables did you eat over the course of 3 days?*
   - *How many new vegetables did you eat over the course of 3 days?*
   - *What were some of the challenges you faced?*

   Invite students to share their reflections. Then celebrate by allowing students to race around the school track or field and then fuel up with a vegetable snack. Alternatively, recognize students that cross the finish line with race car-themed rewards, such as car-shaped erasers.

Teacher Tip! *Display the **Dig In! Race Car** and **Video Game** posters in a visible location in the classroom so that students can reference them as they take on the challenge. Can they identify all the fruits and vegetables? Are there any new fruits and vegetables they can try that will help them "zoom" across the finish line?*

BROCCOLI FUN FACTS

Share With Students:

The word **broccoli** comes from the Latin word "brachium" which means branch, or arm.

Broccoli is grown in nearly every U.S. State, including Alaska and Hawaii. California grows the most.

Broccoli is packed with vitamin C, which helps heal cuts and wounds and keeps teeth and gums healthy.

Choose broccoli that is dark green – which indicates a healthy plant. Avoid broccoli with stalks that bend; open, flowering, or discolored clusters; tough, woody stems.

Eat smart to play hard with broccoli. Snack on raw broccoli and low-fat dip. Choose broccoli sides at lunch. Ask your parents to make broccoli for dinner.

IMPORTANT FOOD SAFETY STEPS!

Please see p. 4 for a reproducible handout to post in a visible location in your classroom. It is important that you follow these steps to keep yourself, your students, and any parents or volunteers safe and healthy.

Hand Washing:
All persons participating in the food preparation activity (teachers, students, volunteers, parents) should wash hands before and after preparing, handling, or sampling foods.

Allergy Alert! *See p. 2 for more information on food safety and allergies before starting this food preparation activity.*

COOKING DEMONSTRATION

Invite a chef to come in and demonstrate the cooking of a broccoli recipe. You may also work together with your school's food service staff to see if they can prepare any recipes featuring broccoli for students to sample. (For example, a broccoli stir-fry, broccoli slaw, broccoli-macaroni casserole, broccoli salad, or steamed broccoli with low-fat cheese.) ***Dig In! at Home*** includes a Chic' Penne recipe that your class may wish to try.

DIG DEEPER! (SOCIAL STUDIES)

Explore how humans and animals seek out what they need to survive.

- Have students work in pairs to research an ancient civilization. Ask them to investigate why they believe people settled where they did. How were they seeking out what they needed? (For example, many civilizations would settle near a water source for drinking and to irrigate crops. *Why would other civilizations settle in the mountains? How did they get food and water?*)
- Discuss the topic in more depth by asking students to think about: What challenges did ancient civilizations have? Are any of these challenges similar to ones we as a modern society have?
- To explore this topic further, see Lesson 6 (p. 42) for more activities on what foods are grown around the world.

Activity III. Tasty Broccoli (20 minutes, Health)

Prepare: *If broccoli is growing in your garden, see if it is ready for harvest. If not, use samples purchased from a market or store. Buy broccoli with the stalk so students can see the whole vegetable as it comes from the plant. Have students help you with preparation (under your supervision). Set up a tasting station with plates and at least three different salad dressings or dips (for example, hummus, balsamic vinaigrette, or ranch dressing).*

1. Show students what broccoli looks like when it is harvested from the garden (with stalk). Explain that it can be purchased at the store like this, or precut in bags, or frozen. Review with students by asking: *What part of the plant does broccoli come from? (The floret is the flower, while the stalk is the stem.) What vegetable subgroup does it belong to? (**Dark-Green Vegetable Subgroup**.)* Share with students some additional broccoli fun facts (see sidebar, p. 35).

2. Have students wash their hands following proper procedures (see p. 5). With supervision, have them rinse the broccoli under cold, running water. Next, have students break broccoli into bite-size sections and plate the samples (If students cannot have access to a clean sink for rinsing the broccoli, provide prewashed, ready-to-eat broccoli for your class to sample.) Each student should get at least four pieces. Ask a volunteer to put samples of the different dips into small plastic cups for each student to try.

3. Have them first note in their **Garden Journals** the taste of the broccoli without dip – observing the texture, flavor, and color. Then ask students to write down their opinions after tasting broccoli with each of the dips.

REFLECT (10 minutes)

1. Ask students to reflect in their **Garden Journals** on useful tips to share with friends and family of ways to include more vegetables into their meals. Ask: *How can you seek out what you need to make half your plate fruits and vegetables? What vegetable would be fun to eat as a snack after school? What vegetable would make a good "on-the-go" snack?* Split the class into small groups and provide each with poster board and art materials. Have them illustrate their tips on posters to place in the cafeteria.

EXTENSIONS

Colorful Survey. Have students look at the school lunch menu to see if broccoli is offered and how it is prepared. Survey students to see which broccoli offering is their favorite and identify other ways they might like to see it included on the cafeteria menu. Share your results with the District Food Service Director.

Home-and-Seek. Ask students to look for fruits and vegetables at home. Have them look in their fridge and pantry, and list in their **Garden Journals** what produce they found. They can help their families by making a shopping list of fruits and vegetables they would like.

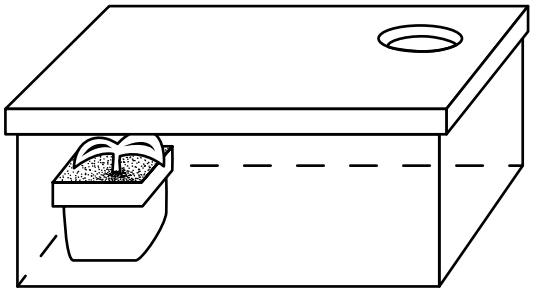
A-Maze-ing Light

LESSON 4 HANDOUT 1

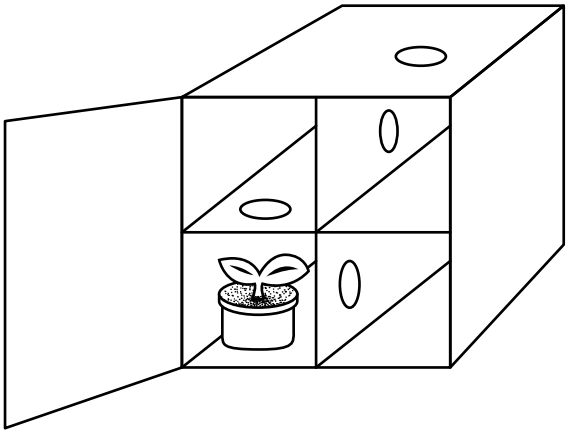
Name: _____ **Date:** _____

What do plants need to grow? Do they seek out what they need? Conduct an experiment to find out!
You will build a maze for a bean plant to see what happens when a plant has minimal sunlight.

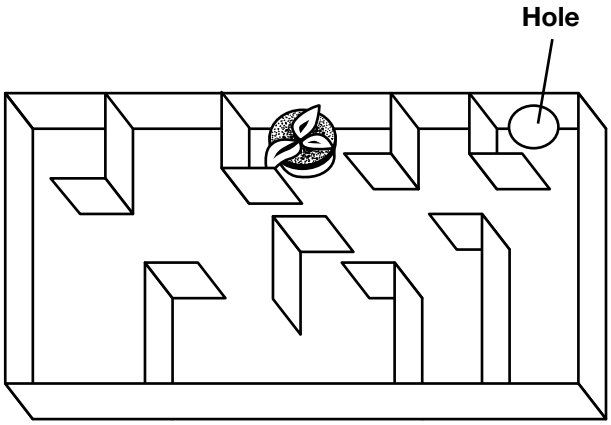
Sample 1



Sample 2



Sample 3



1. **Hypothesize:** Write down your predictions to the following questions in your **Garden Journal**.
   - What do you think plants need to grow?
   - Do you think plants change their growth to follow the sun?
   - What would happen to a plant if sunlight were blocked?

2. **Design your maze:** It does not need to be complicated to make the experiment successful. Study the mazes to the left. Then use cardboard to create your walls. Make sure there is a hole leading from the outside of the box to the inside. Water your plant before you place it in your maze. Cover the maze and position the box so that sunlight will shine into the box through the hole.

3. **Hypothesize:** What do you think will happen to the plant next week? In 2 weeks? Draw a "prediction growth picture" in your journal mapping the growth pattern you think your plant will take.

4. **Measure:** Check in on your maze every day. If the top of the soil is dry to the touch, add a little water. Measure and record the growth of your plant. Keep this data in your **Garden Journal**.

5. **The results:** At the end of the experiment, do a final measurement of the growth of your plant. Write down the results. How do the results compare to your hypothesis? Why do you think it grew the way it did? What can you conclude based on this experiment?

6. **Graph, chart, or map your experiment results.** Then have an A-Maze-ing Plant display! Decorate and color the outside of your mazes.

Fuel Up With Veggies...Zoom to the Finish! (Page 1 of 2)

Know how you can really get your engine going? Make half your plate fruits and veggies. They'll help you be your best at school and at play.

Are you fueling up with enough dark-green, red, and orange veggies, and beans and peas during the week? Take the challenge to track your meals for three days to find out if, and how fast, you can zoom across the finish line!

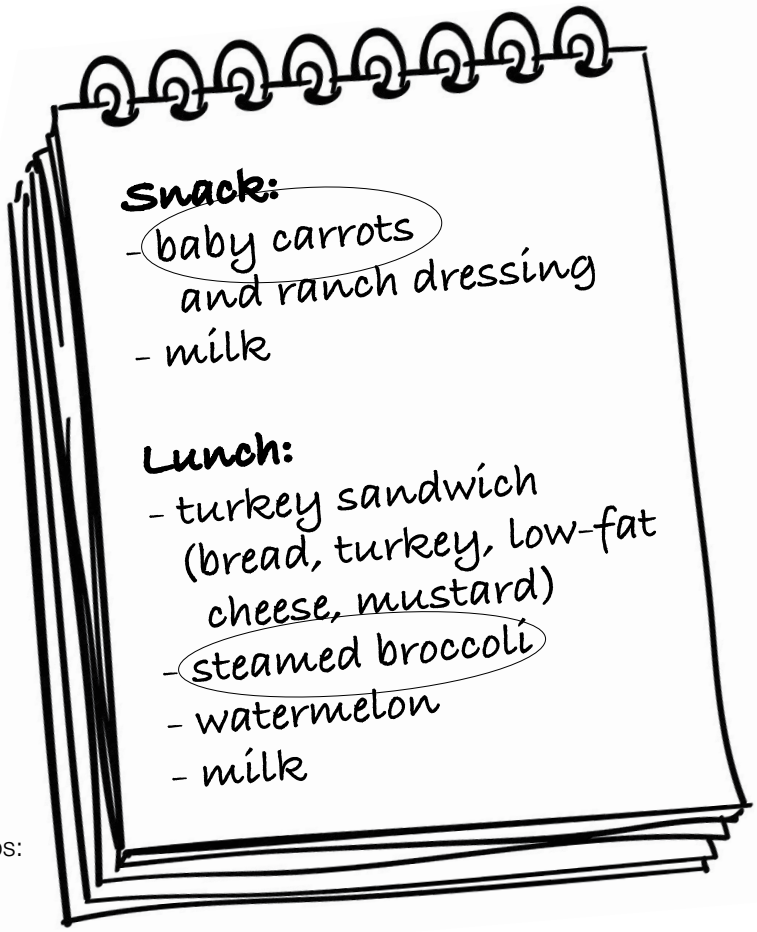
Challenge Instructions:

1) TRACK: For 3 days, write down everything you eat and drink (at meals, snacks, or in between) in your **Garden Journals**. Circle all the veggies. (See example on right.)

2) EVALUATE: Make a list of each new vegetable you tried. Then, sort the vegetables you ate into the five vegetable subgroups: **Dark-Green**, **Red and Orange**, **Beans and Peas**, **Starchy**, and **Other**.

3) ZOOM AROUND THE TRACK:

- Use the track on the next page. For each vegetable portion you eat, move one space on the track. You cannot count the same vegetable twice. (For example, If you eat broccoli on Day 1 for lunch and dinner, you can only count it once. But if you eat it also on Day 2, you can move another space.)
- Write down the name of the vegetable in each space you move through.
- Give yourself a **Turbo Boost!** For each **NEW** vegetable you eat, you earn one extra space! Write it into the empty space.
- You may not cross the finish line until you have eaten at least one veggie from EACH of the following subgroups: **Dark-Green**, **Red and Orange**, **Beans and Peas**. Circle them clearly on the track.



Tip! The more variety you eat, the faster you'll move around the track!

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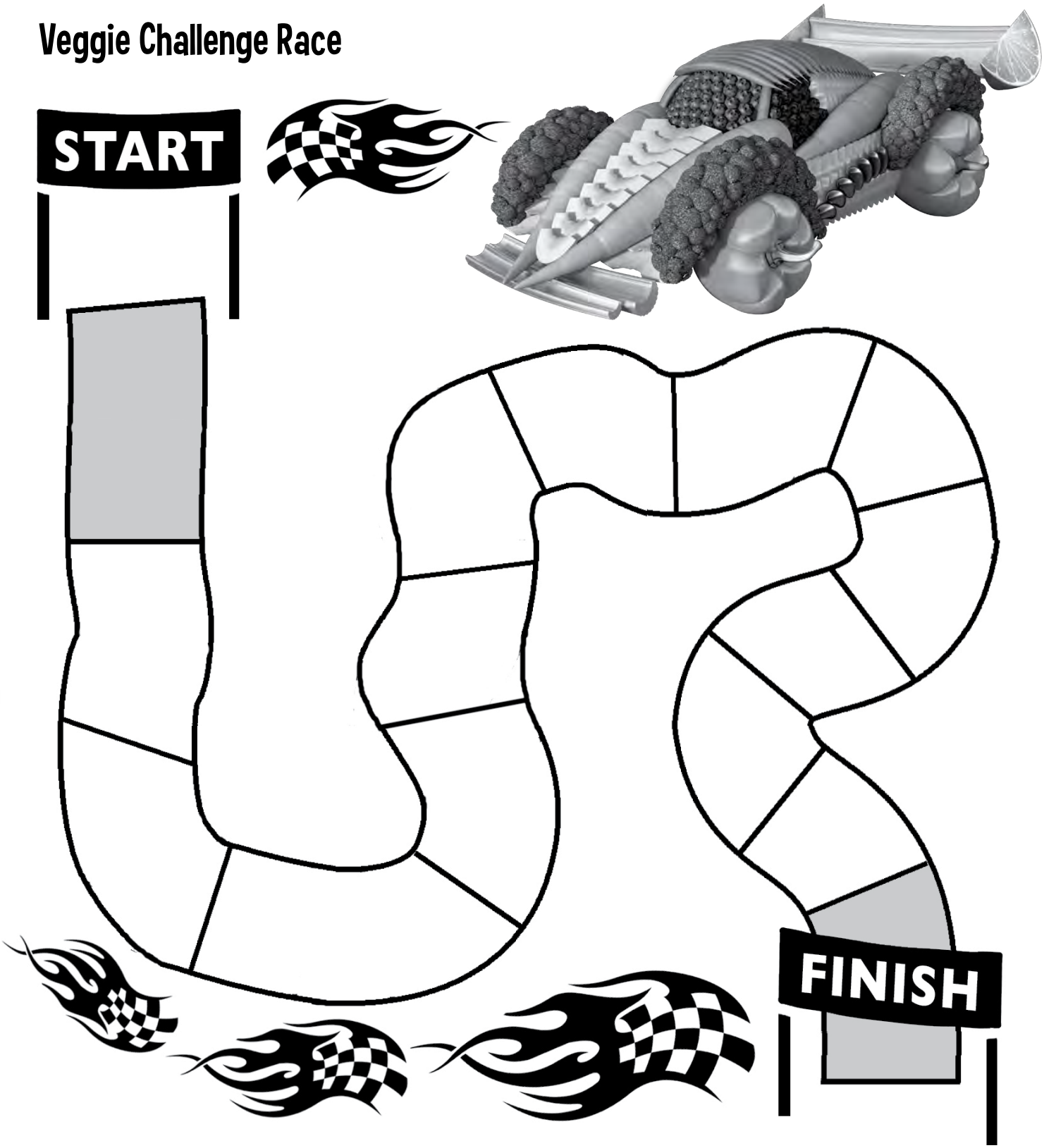
Name: _____ Date: _____

Veggie Challenge Race



Lesson 5: Eat Your Colors

TOTAL TIME REQUIRED: 95 minutes / 3 sessions
Session 1: **Getting Started** 15 min;
Activity I "Triple Taste Combo Game" 20 min (English Language Arts)
Session 2: **Activity II "Get Your Engine Going"** 20 min (Health/Science)
Session 3: **Activity III "Garden Designers"** 30 min (Math/Art – can be done with art teacher); **Reflect** 10 min

LESSON OVERVIEW:

Students will learn that including fruits and vegetables of many colors at meals looks attractive, and helps them get the nutrients they need to grow and be healthy. They will also learn more about the **Red and Orange Vegetable Subgroup** and design a colorful garden.

ESSENTIAL QUESTIONS: *What colorful veggies can flavor up my plate? How can I be sure I'm getting all the nutrients I need?*

TEACHING PROCEDURE:

GETTING STARTED (15 minutes)

1. Write the following riddles on the board and have students write them down and guess the answer in their **Garden Journals**.

   Q: "Does this clue ring a bell? I'm sweet, but not spicy. I'm no longer green because I've been hanging out for a while."
   A: Red and orange bell peppers

   Q: "I'm one sweet root that's orange inside. Some people confuse me for a yam."
   A: Sweet potato

   Q: "I'm a crunchy root that's fun to dip. Enjoy me 'baby size' or cut into sticks."
   A: Carrot

2. Ask students: *What do these three answers have in common?* They are all vegetables and they are part of the **Red and Orange Vegetable Subgroup**! ***Note:*** *Yellow and green peppers are part of the* ***Other Vegetable Subgroup****.*

3. Review with students that eating a colorful variety of fruits and vegetables at meals and snacks helps their bodies get the nutrients they need to grow and be healthy. Most people need to eat more from the **Dark-Green**, **Red and Orange**, and **Beans and Peas Subgroups**. *(Lessons 3, 4)*

Key Message:

Rock your colors! Choose red, orange, and dark-green veggies at meals and snacks.

Subject Connections:

English Language Arts, Science, Math, Health, Science, Math (Art – see p. 39)

Learning Objectives:

Students will be able to…

- Describe ways to include a variety of fruits and vegetables in their diet.
- Design and plan a colorful garden using a variety of vegetables that grow well together.
- Plan a healthy meal featuring the vegetable subgroups.

Supplies (per student)

- Access to sink with warm, running water and soap
- Plates, bowls (for dips and fillings), spoons, forks, and napkins (per student)
- Graphing and plain paper, colored pencils, rulers, poster board
- **Garden Journals**
- Student handouts (pp. 78-79):
  1. ***Garden Companions***
  2. ***My Garden Plan***
- ***Dig In!*** poster – ***Veggie Rock Stars***

Featured Fruits and Vegetables:

Red and orange bell peppers
Provide enough raw bell peppers (rinsed, seeded, cut into scoops) to provide students with 4 to 5 scoops. Provide water (and cups) for students to drink as they taste the vegetables.

Additional Foods:

Provide a variety of fillings for a bell pepper tasting activity on pp.38-39. (For example, brown rice with beans, veggie salsa, hummus, bean dip, or low-fat veggie dip.)

Teacher Tip!
*Display the **Dig In! Veggie Rock Stars** poster in the classroom. Looking at the poster, ask students if they can identify vegetables in the **Red and Orange Vegetable Subgroup** Which ones have they tried before, and which ones will they try?*

***Note:** A list of all vegetables pictured in the poster can be found at: **http://teamnutrition.usda.gov/Resources/dig_in.html**.*

RED AND ORANGE VEGETABLE SUBGROUP

Acorn squash

Butternut squash

Carrots

Hubbard squash

Pumpkin

Red and orange bell peppers

Sweet potatoes

Tomatoes (including tomato juice and tomato sauce)

POPULAR AND TASTY COMBINATIONS

Stew: Carrots, potatoes, onions

Chili: Peppers, tomatoes, kidney beans

Fruit Salad: Apple, banana, strawberries

Crudité Tray: Broccoli, carrots, celery

Mixed Vegetables: Corn, carrots, green beans

PROFESSIONAL FOOD PREPARATION

Invite a guest chef or dietitian to show the class how to use colorful veggies to make healthy meals appealing. They may wish to demonstrate how to make the Colorful Quesadillas recipe from ***Dig In! at Home*** and provide samples for everyone to try.

4. Write the words **Red and Orange Vegetables** on the board. Have students volunteer names of vegetables that are in the **Red and Orange Vegetable Subgroup**. List them on the board. ***Note:** Beets range from red to deep purple in color; however, it is important to note that they are not part of the **Red and Orange Vegetable Subgroup** (see sidebar).*

LEARNING ACTIVITIES

Activity I. Triple Taste Combo Game (20 minutes, English Language Arts)

1. Next, play the ***Triple Taste Combo Game***. Ask a student to start by naming a colorful fruit or vegetable. Then, ask two more students to name a different colored fruit or vegetable they think might go well with the first one. (For example, the first student might start with "lettuce." The next two students may volunteer "onion" and "tomato." The resulting combination would be "lettuce + onion + tomato.") Ask students where they might eat this combination (*on a sandwich*). Starting with "tomato," have two more students create another combination.

2. You can also allow students to have one of the three foods in their combination be from another food group *(such as yogurt, blueberries, and strawberries)*. The combinations will get creative and you may come up with some clever new snacks!

Activity II. Get Your Engine Going (20 minutes, Health/Science)

***Allergy Alert!** See p. 2 for more information on food safety and allergies before starting this food preparation activity.*

***Prepare:** Set up a tasting station with red and orange bell peppers. Rinse and cut enough bell peppers to give students four to five pieces each. Cut the pepper into four to five pieces lengthwise so the curve at the end is shaped as a "scoop." Get rid of the seeds. Work with parent volunteers or school food service staff to provide a couple of different foods students can use as "fillings" for the red pepper vehicles. (For example, brown rice with beans, salsa, hummus, bean dip, or low-fat veggie dip.) You can also use other veggies or fruit as fillings after they are finely chopped.*

1. Tell students they will now taste red and orange pepper vehicles! Explain that these bright colored peppers are part of the **Red and Orange Vegetable Subgroup**, and are full of good nutrients including vitamins A and C. Their shape also happens to make a great "vehicle" to scoop different dips or fillings (*whatever you are able to provide).*

2. First, have students wash their hands following proper procedures *(see sidebar)*. Give students plates, forks, spoons, and napkins. Provide them each with three to five pepper "scoops" and a sampling of dips. Before they fill their peppers with anything, have them taste the pepper on its own and write down their observations in their **Garden Journals**. Next, have them spoon different fillings into their red or orange bell pepper vehicles to taste. Ask students to write down each combination, and a reflection on the flavors of each sample.

3. Invite students to share their thoughts. Ask: *What was your favorite pepper vehicle combination? Do you have ideas of other unique combinations you may want to try? How did the combination change or enhance the flavor of the pepper?* If serving orange and red bell peppers, ask them to reflect on whether the two varieties taste different or similar.

Activity III. Garden Designers (30 minutes, Math/Art)

Teacher Tip! *Collaborate with the **Art** teacher to turn student garden plans into colorful works of art. Display them around the school.*

1. Provide each student with a copy of the handout ***Garden Companions*** *(p. 79)*. Now that students have explored how to combine colors and flavors in the kitchen using fruits and vegetables, students should continue to think in color, but this time in the garden.

2. Ask students: *What new and colorful variety of fruits and vegetables can we grow in our garden? What plants grow well together?* Explain that just as certain foods look and taste good together, certain plants grow better together. (For example, have you or your students ever heard of a "Three Sisters Garden"? It is an ancient and common agricultural/gardening practice of intercropping, or simultaneously growing crops (corn, squash, beans) together in the same area.) Corn grows tall and provides the height and surface for beans to climb. Squash grows low and over the ground, shading the soil and protecting her "sisters" (corn and beans) from weeds. Beans also help her sisters through the roots, which keep the soil fertile with nutrients from the sun. Which of the three sisters are growing in your garden? Do any local farms practice companion planting? **(p. 101)**

3. Have students work in their **Garden Teams** to design a colorful garden. Provide them with the handout ***My Garden Plan*** *(p. 78)*, or graphing and plain paper, colored pencils, and rulers. Alternatively, they can also make collages of images for their garden plan instead of drawing. Encourage them to use the list of fruits and vegetables from the beginning of the lesson (Getting Started, step 4, p. 38) as well as the Garden Companions handout (p. 79), for reference. You may want to set some parameters before beginning, such as the size of the garden or to include certain vegetables (for example, red bell peppers). Have them draw their designs to scale on their graph paper. Otherwise, allow your students to use their imaginations and be creative in designing their own edible garden!

IMPORTANT FOOD SAFETY STEPS!

Please see p. 4 for a reproducible handout to post in a visible location in your classroom. It is important that you follow these steps to keep yourself, your students, and any parents or volunteers safe and healthy.

Hand Washing:
All persons participating in the food preparation activity (teachers, students, volunteers, parents) should wash hands before and after preparing, handling, or sampling foods.

DIG DEEPER! (SOCIAL STUDIES)

In addition to companion planting, it is important to consider the weather and amount of sunlight and shade in each area of your garden.

- Have students check the garden at different times of the day to determine which plots are the sunniest and shadiest to determine what plants will grow best there.
- Ask students to check the **Growing Guide (p. 96-99)** to find out which plants can be planted and harvested at the same time of the year. They should factor this information into their garden plans.

REFLECT (10 minutes)

1. Have students reflect in their **Garden Journals** on the following questions, then invite students to share their reflections with the class: *Why is it important to consider the color of foods when planning a meal? Did your dinner last night include any colorful fruits and vegetables? How about your lunch? How would you feel about eating bell pepper vehicles for a snack at home? What type of bell pepper vehicle would you make for each member of your family?*

EXTENSIONS

Rainbow Meals. Have students collaborate with the cafeteria staff on how to include a colorful variety of fruits and vegetables, present meals in attractive ways, and incorporate garden colors on the school lunch menu. Team Nutrition's *Recipes for Healthy Kids Cookbook* includes kid-tested recipes for Rainbow Rice, Purple Power Bean Wraps, and more! **http://teamnutrition.usda.gov**

Garden Colors Day. Encourage kids to choose a rainbow of fruits and vegetables from the cafeteria on a "Garden Colors Day" by rewarding them with inexpensive food-related prizes, such as temporary tattoos of fruits and vegetables or food-themed stickers. Prizes are earned by eating at least three differently colored fruits or vegetables.

DIG DEEPER! HEALTHY PROMOS

Using the existing ***Dig In!*** posters as inspiration, have students create their own colorful posters with motivating slogans featuring healthy choices. Then display them around the school and cafeteria as inspiration for others to eat more fruits and vegetables.

GARDEN DESIGN

If you have just begun your school garden, think about how you can design it to integrate plant companions. (p. 101) Collaborate with your students using their garden design plans. If your garden is already growing, think about what new fruits and vegetables you want to grow. Perhaps you want to expand your garden with new containers or a new garden bed.

My Garden Plan

Name: _____ **Date:** _____

Use this template to plan your garden and determine what fruits and vegetables you want to grow. Think about what plants grow well together (see ***Garden Companions*** for information). Use your **Garden Journals** and extra graph paper to take notes, and sketch out your plans first. Don't forget to measure your garden plot and draw it to scale below. Map out where plants should go by writing the number of each plant on your list.

Plant List

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____

Notes: _____

_____

_____

_____

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Garden Companions

Name: _____ **Date:** _____

A colorful combination of food on a plate can enhance the way a meal looks and tastes. In the same way, plants growing in the garden can complement each other, too. While chefs think of how to combine flavors, gardeners also think about what grows well together. Did you know that onions help tomatoes and peppers grow by repelling pests? Or that beets help lettuce by adding minerals to the soil? The science of gardening is fascinating!

Use this sheet to help you design a garden that is not only colorful but grows well, too.

Companion: Beans and Peas

Help Corn

How: Beans and peas increase nitrogen supply in the soil available for corn.

Companion: Onions

Help Carrots

How: Onions help repel the carrot fly.

Companion: Radishes

Help Cucumbers, Squash

How: Radishes help repel cucumber beetles.

Companion: Potatoes, Tomatoes, and Onions

Help Cabbage

How: Potatoes, tomatoes, and onions repel cabbageworm, which is a common pest of the cabbage family.

Companion: Beans

Help Corn, Cucumbers, Potatoes

How: Cucumbers, potatoes, and corn use a lot of soil nutrients. Beans add nitrogen back into the soil and don't require a lot of additional nutrients.

Companion: Corn

Help Cucumbers, Squash, Potatoes

How: The lower growing plants help reduce weed growth by covering the ground. The corn provides a nice tall stalk for the vining plants to climb.

Lesson 6: The Global Garden

TOTAL TIME REQUIRED: 140 minutes / 3 sessions
Session 1: **Getting Started** 10 min;
Activity I "Fruits and Vegetables Around the World" 40 min (Social Studies/Health)
Session 2: **Activity II "Global Recipes"** 20 min (English Language Arts/Health);
Activity III "Tasty Chickpeas" 40 min (Health)
Session 3: **Activity IV "Garden Pen Pals"** 20 min (English Language Arts);
Reflect 10 min

LESSON OVERVIEW:

In this lesson, students will explore culinary traditions and how fruits and vegetables are grown and cooked around the world and throughout the United States. They will learn about global gardening and how other languages have contributed to our culinary vocabulary.

ESSENTIAL QUESTIONS: *What fruits and vegetables are grown near me? What are some of the different fruits and vegetables grown around the world? How can I eat a fruit or vegetable in different ways?*

ADDITIONAL SUPPLIES:

Potato masher or mortar and pestle (or blender/food processor), colander, large bowl, large spoon for stirring, tablespoon for serving, measuring cup and spoons, can opener

ADDITIONAL INGREDIENTS FOR HUMMUS RECIPE:

Recipe on p. 80 serves 8; adjust as needed: cans of chickpeas (rinsed and drained), water, garlic cloves, olive oil or other vegetable oil, lemon juice, salt and pepper, whole-wheat pita breads (cut into triangles), a variety of rinsed and raw vegetables cut into sticks (for example, zucchini, cucumber, carrots). Optional: paprika, tahini*

***Allergy Alert!** Tahini contains sesame seeds. As noted on p. 2, ask parents to provide information about any food allergies before any class food preparation activities. You may wish to provide parents with a copy of the recipe ahead of time.*

TEACHING PROCEDURE:

GETTING STARTED (10 minutes)

1. Begin by telling students they will explore what influences their food choices. Ask them to reflect on the following questions in their **Garden Journals**. *How do I decide what to eat? Do I stick to the same foods? How often do I try new foods? What fruits and vegetables do I eat most often? What is the most interesting new food I've ever tried?*
2. Invite students to share their responses and guide a discussion by asking if students decide what to eat based upon: how they know a food will taste, what is available at home or school, a commercial they liked about the food, its attractive packaging, because their friends are eating it, or something else. Ask students to think about what other influences may affect their choices.
3. Ask if students ever tried something new and discovered that they liked it. Invite volunteers to share their stories.

Key Message:

Explore the world of possibilities in the garden and on your plate.

Subject Connections:

English Language Arts, Math, Science, Social Studies

Learning Objectives:

Students will be able to…

- Explain how an environment influences the type of fruits and vegetables that are grown and eaten in a region/culture.
- List ways fruits and vegetables grown in the school garden are prepared and eaten in different regions of the United States and the world.
- Describe various units of measurement used to communicate quantities in a recipe (such as serving sizes and ingredient amounts).
- Identify vegetables that are part of the **Beans and Peas Vegetable Subgroup**.
- Identify three ways chickpeas (garbanzo beans) can be eaten as part of a meal.

Supplies:

- Plastic gloves, apron, bowl, spoon, napkin (per student)
- Access to sink with warm, running water and soap
- Cookbooks, recipes (featuring a variety of cultures, global recipes)
- Art supplies, paper/poster board
- World map, atlas
- **Garden Journals**
- Student handouts (pp. 80-81):
  1. ***Tasty Chickpeas***
  2. ***Garden Pen Pals***
- ***Dig In!*** poster – ***Race Car***
- Optional: Computer access, Internet

Featured Fruits and Vegetables:

Chickpea (Garbanzo bean)
Provide enough dry samples for students to observe.

GLOBAL FOOD STORIES (SOCIAL STUDIES/ENGLISH LANGUAGE ARTS)

Have students research different food stories from their region. (For example, students can use a search engine to find "food news in India" or "children and food in Virginia.") Encourage students to read a few of the articles presented to learn if anything interesting is happening in their chosen region involving fruits and vegetables. They may be surprised at how often the world thinks about the simple foods they eat every day.

DIG DEEPER!

Have students map and chart what foods are grown in which U.S. and global region. As a further extension, have students check and identify which items can be found in local markets. Repeat the mapping activity in Lesson 2 (p. 21) to calculate the distances of their favorite fruits and vegetables.

EXPLORE CULINARY TRADITIONS (SOCIAL STUDIES)

Culinary traditions, like ingredients and flavors, vary around the country and the world. Some European countries traditionally serve their salad after the meal instead of before like in most American restaurants. Some cultures serve sorbet between courses to cleanse the palate. Other cultures have their meals extend for a very long time, rather than eat "fast food." Culinary utensils also vary. Some cultures eat with their hands or chopsticks, or use plates made of large leaves. Have students further explore their assigned geographical regions to find out more.

LEARNING ACTIVITIES

Activity I. Fruits and Vegetables Around the World (40 minutes, Social Studies*/Health)

See sidebars on this page and next for additional Social Studies connections.

1. Divide the class into teams of three and assign each group to a different geographical area. Have each team choose a specific fruit or vegetable to investigate from the list below. Encourage each team to choose one that is not so familiar.

Note: *This is not a complete list.*

U.S., Northeast
- **Fruits:** Wild blueberry, cranberry, raspberry, apple
- **Vegetables:** Beans (for example, navy bean), kale, pumpkin, broccoli

U.S., Southeast
- **Fruits:** Peach, orange
- **Vegetables:** Dark-green vegetables (for example, collard, turnip, or mustard greens), beans (for example, black-eyed pea, pinto bean, butter bean, sweet potato)

U.S., Midwest
- **Fruits:** Apple, cranberry
- **Vegetables:** Corn, soybean

U.S., Northwest
- **Fruits:** Apple, grape
- **Vegetables:** Black bean, soybean, pea, potato, turnip

U.S., Southwest
- **Fruits:** Citrus, grape
- **Vegetables:** Spinach, artichoke, leaf lettuce, cauliflower, pea, squash, green pepper, tomato, onion

MEXICO
- **Fruits:** Pineapple, papaya, guava, prickly pear, pitahaya fruit, melon
- **Vegetables:** Beans (for example, pinto bean or black bean), pepper, tomato, plantain, avocado, jicama

CHINA/JAPAN
- **Fruits:** Citrus fruit, litchi, peach, persimmon, Asian pear
- **Vegetables:** Beans (for example, soybean), dark-green vegetables (for example, bok choy), mushroom, yam, taro, pea, bamboo, giant radish (daikon)

INDIA
- **Fruits:** Mango, banana, Indian gooseberry, citrus fruit, coconut, papaya, starfruit
- **Vegetables:** Beans (for example, lentil, chickpea, black-eyed pea), carrot, cauliflower, green bean, green pepper, okra, gourd, taro, potato, cabbage

MIDDLE EAST/ NORTH AFRICA
- **Fruits:** Pomegranate, fig, walnut, quince, date, cherry, apricot, grape
- **Vegetables:** Eggplant, chickpea, asparagus, okra, leek, moulikhiyya

CENTRAL/SOUTH EUROPE (FRANCE, ITALY)
- **Fruits:** Apple, cherry, peach, nectarine, pear, rhubarb, plum, grape, orange, tangerine, strawberry, apricot, melon, persimmon
- **Vegetables:** Tomato, beans (for example, chickpea, fava bean, cannellini bean, lentil), dark-green vegetables (for example, spinach, Swiss chard, broccoli), endive, carrot, beet, turnip, radish, cucumber, asparagus, zucchini

Sources: P. Kittler and K. Sucher, Food and Culture, 5th edition, Belmont, CA: Thomson Wadsworth, 2008; Food and Agricultural Organization of the United Nations (http://www.fao.org); U.S. Environmental Protection Agency (http://www.epa.gov/oecaagct/ag101/cropmajor.html); USDA (http://planthardiness.ars.usda.gov)

2. Ask each group to explore the reason for using specific ingredients. For example, why are some ingredients used in certain geographic areas or cultures? Why do many Asian dishes incorporate rice or soybeans? Why do recipes from Central American countries include beans, corn, and cilantro? Why do Mediterranean dishes use olives, grapes, and tomatoes? *(These foods grow abundantly in those regions.)* Allow students to share their answers. Explain that spices and herbs can vary by country (for example, cumin, garlic, mint, basil, and cilantro) and can be a tasty way to add flavor to food without using as much salt.

Teacher Tip! *Connect this activity to the topic of ancient civilizations. See Lesson 4 (p. 33) for more ways to tie the garden to this topic.*

3. Explain that long before our world was as connected as it is today, before airplanes could transport foods across continents quickly, people ate only what could be grown in their region. Today, we can try ingredients from all over the world because these foods can reach us before they spoil. But various cultures and regions still prepare traditional foods because they are familiar, delicious, and an important part of their culture.

4. Ask students to also consider why some recipes are traditionally associated with certain seasons. For example, in the United States, why are peaches used in summer recipes? Why are sweet potatoes and cranberries often featured in the fall, or at holidays like Thanksgiving? Why do some towns have strawberry festivals in the spring? *(In the U.S., those are the times when these fruits and vegetables are usually in season, which means they are more plentiful, cost less, and taste the best.)*

5. Have students research their fruit or vegetable using encyclopedias, cookbooks, and other library or online reference tools. What interesting facts can they find out about their assigned food? How does it grow and how is it prepared in their assigned geographic region? For example, **falafel** is a Middle Eastern specialty in which ground chickpeas are combined with spices, shaped into balls or patties, and then fried.

6. Students will next create an international "passport" for their fruit or vegetable. They should include a photo or drawing of the food, where it is grown, where it travels (export/import), and additional fun facts. Encourage them to think creatively about what can be learned of the region in which their food is found. The origin of fruits and vegetables offers fascinating research!

Activity II. Global Recipes (20 minutes, English Language Arts/Health)

Prepare: *Provide students with access to international and regional cookbooks, recipes (featuring chickpeas/garbanzo beans), and/or access to the Internet. Have enough dry chickpeas for each student to observe.*

1. Ask students: *Have you ever eaten a chickpea, or a food made from chickpeas? In what form? What plant part are they? (Seed) What vegetable subgroup do they belong to? (**Beans and Peas**)* Explain that they may also be called "garbanzo beans."

LOCAL NATIVES (SOCIAL STUDIES)

Have **Garden Teams** explore and research what grows in and around your region. What is a local native fruit or vegetable? Find out by visiting or talking to a farmer. Is one of the Three Sisters (corn, squash, and pole beans – which are native to America) growing at a farm near you? (See Lesson 5 for more on companion planting.)

KITCHEN CHIT-CHAT (ENGLISH LANGUAGE ARTS)

Al dente, croques monsieur, jambalaya, fondue, mince, julienne, sauté, blanche, flambé!

Students may come across unfamiliar culinary terms as they browse through recipes. Compile a list of new vocabulary words (foods, ingredients, equipment, techniques) and then divide them among students to research.

What they discover may surprise them! Take the meaning and origin of the word "**sauté**" for example. Did you know it is French for "jump?" Quite different from a Southeast Asian "**satay**."

Have students create trivia questions based on what they learned and use their newfound culinary vocabulary to challenge another class.

GARDENS AROUND THE WORLD (SOCIAL STUDIES)

In Africa, gardeners struggle with long periods of drought. Some farmers use a **Keyhole Garden** to solve this problem. They plant their vegetables in a raised bed the shape of a keyhole (a long column with a circle at one end). There is a heap of compost in the center of the circle. The farmer waters the compost with recycled water which filters through the compost. The water moves down the keyhole, bringing both water and nutrients to the fruits and vegetables planted along the way.

In New York City, the tops of the skyscrapers are sprouting **rooftop gardens**! These gardens offer more than delicious local fruits and vegetables; the plants absorb rainwater, which solves the problem of too much water flowing into the city's sewers at one time. The plants also help insulate the buildings from extreme heat or cold.

In Southeast Asia, rice paddies can be built into steep hillsides as terraces and can be planted next to marshes or rivers. When the paddies are flooded, the rice can grow easily but weeds are discouraged. The water buffalo is well suited to working in wetlands and is used frequently in paddy fields.

In Mexico, chinampas, or "**floating gardens**," were built by ancient Aztec Indians in shallow lake beds. The gardens were layered with mud and decaying vegetation until the garden rose above the level of the lake. The gardens were in small rectangles separated by channels just wide enough for a canoe to pass. These "islands" had very high crop yields with up to seven crops a year.

2. Distribute the handout ***Tasty Chickpeas*** (p. 80). Pass around dry chickpea samples so that each student gets one to touch and observe. Explain that chickpeas are harvested from the seedpod of a chickpea plant. Show them an example of a chickpea plant in the garden (if growing) or on the handout.

3. Explain that the chickpea is a small, round bean with a mild, nutty flavor. They are the seed of the plant and grow inside a pod usually 1 inch long and 1 inch wide (similar to the size of a quarter). They are grown throughout the Middle East, India, Turkey, Africa, and the United States. The bushy plant with feathery leaves grows to about 18 inches tall and has either white or violet-colored flowers depending on the variety. The chickpea itself can vary in color from dark green to a light brown when harvested. When harvested from the garden, chickpeas are first dried, then the outer thin shell is peeled off. You can buy them at the grocery store dried or canned. Before cooking, dried beans are soaked in water to soften the beans and reduce cooking time. One way is to soak the beans overnight. The beans are then drained, rinsed, and cooked in fresh water. Canned beans have already been soaked and cooked. They are often drained and rinsed before using them in a recipe.

4. Explain that there are lots of tasty ways chickpeas are prepared and eaten around the globe. Have students search online for recipes that contain chickpeas. For instance, try the ***Recipe Finder*** at **http://recipefinder.nal.usda.gov/** or the ***Recipes for Healthy Kids Cookbook*** at **http://www.teamnutrition.usda.gov/Resources/recipes_for_healthy_kids.html.** ***Note:*** *If your class is not able to search for recipes, you may complete steps 5-7 using the Happy Hummus Recipe on the student handout.*

5. Ask students to identify the key elements required in a recipe (name of recipe, amounts of ingredients, preparation time, equipment, cooking instructions, and number of servings). List these on the board. Discuss the purpose of this information. What happens if something is missing? (For example, without proper measurements for each ingredient, the dish may not taste the same each time.) What other features make a recipe seem enticing? *(Color photographs? Illustrations? Simplicity?)* Add these to the list on the board.

6. Next, each group will decide on one chickpea recipe to examine. First, have students study the ingredients. Ask: *What other fruits or vegetables are featured? Does the recipe include spices? Are there any ingredients you don't recognize? Can the ingredients be found in the school garden or local market?*

7. As a final journey in their culinary explorations, have students share and present their chickpea recipes in a visual display with a world map. Hang this in the cafeteria or school hallway to share the international adventures with the rest of the school.

Activity III. Tasty Chickpeas (40 minutes, Health)

***Allergy Alert!** Tahini (sesame seed paste) may be a food allergen for some children. If needed, you may omit tahini as an ingredient. See p. 2 for more information about food allergies.*

***Prepare:** If you have a school garden and are growing chickpeas, try this hummus recipe with chickpeas harvested from your garden. **(p. 104)** If not, you may use dry (and prepared) or canned (rinsed and drained) chickpeas. See the recipe on the student handout (p. 80) for all ingredients and equipment needed. Set up a prep station for a group of four to six students with all of the supplies required, including bowls of chickpeas. Each group should prepare its own recipe. Provide plastic gloves, a plate or bowl, spoon, and napkin for each student. Also prepare additional foods to eat with the hummus (such as sticks of zucchini, bell peppers, carrots, or cucumbers; whole-wheat pita bread). You can also customize hummus by adding red bell peppers, zucchini, or herbs from the garden.*

1. Explain to students that in this activity, they will learn about chickpeas and prepare a recipe for hummus provided on the student handout ***Tasty Chickpeas***.
2. Before students begin the food preparation, have them wash their hands, reminding them of the proper procedure (see sidebar). Next, divide the class into groups of four to six students. Have students read through the instructions and check that they have all the ingredients to make the recipe at their food preparation stations. Go over any questions. ***Note:** You may choose to demonstrate and ask for student volunteers to help you instead of having students work at different stations.*
3. Give students 20 minutes to prepare their recipes. They should put on disposable plastic gloves before they handle any food. When the recipe is complete, serve in a bowl garnished with paprika. Explain that this is the traditional garnish for the Middle Eastern dish. Give each student a plate and invite each student to dig in and taste the hummus with different veggie slices and pita bread. Ask them to share what they think about the flavor, texture, and combinations. What are some ways they can eat chickpeas at home?
4. Have students clean up their stations following proper procedures (see p. 4). Cover and refrigerate any leftover hummus, and use within 1 to 2 days.

Activity IV. Garden Pen Pals (20 minutes, English Language Arts)

1. To complete their culinary exploration, distribute the handout ***Garden Pen Pals*** (p. 81) to each student. Explain that they will write to a student in another part of the country or the world in an effort to discover new foods and traditions.
2. Visit the **U.S. Department of Agriculture's Team Nutrition** Web site to find other Team Nutrition schools in other areas: **http://teamnutrition.usda.gov/database.html**. Connect by emailing, writing letters, or using online video-chat software to allow your students to connect with their pen pals face to face.

REFLECT (10 minutes)

1. Have students reflect in their **Garden Journals** on the following questions: *What did I learn in this lesson? What makes me more willing to try a new food? What keeps me from trying something new? What can I do to make fruits and vegetables more interesting?*

IMPORTANT FOOD SAFETY STEPS!

Please see p. 4 for a reproducible handout to post in a visible location in your classroom. It is important that you follow these steps to keep yourself, your students, and any parents or volunteers safe and healthy.

Hand Washing:
All persons participating in the food preparation activity (teachers, students, volunteers, parents) should wash hands before and after preparing, handling, or sampling foods.

EXTENSIONS

Global Garden Cookbook
Compile your students' recipes into a class cookbook featuring global (and regional) fruits and veggies, or chickpeas, prepared in different culinary and cultural ways. Include fun facts students found on each fruit or vegetable, their illustrations or images ("passports"), a glossary of new vocabulary words, and their reflections. Print copies of the cookbook for each student to bring home to their families, or include it alongside fruits and vegetables at a "Garden Sale" (if your school and local health department policies allow). Use the proceeds to help maintain your school garden!

World Fruit and Veggie Day
Work with your school district's Food Service Director to plan school lunch menus with an international or regional theme. Share what your students found in their research on ways other countries might prepare chickpeas, and other fruits and vegetables.

Tasty Chickpeas

Name: _____ **Date:** _____

Eat smart to play hard with chickpeas!
The chickpea, also known as a garbanzo bean, is a small, round bean with a mild, nutty flavor. It is the seed part of the plant and grows in a pod. Chickpeas are grown throughout the Middle East, India, Turkey, Africa, and the United States. There are lots of tasty ways chickpeas are prepared and eaten across the globe.

Hummus is a popular recipe from the Middle East. In fact, the word "hummus" is actually the Arabic word for "chickpea." It is traditionally made with mashed chickpeas, olive or sesame seed oil, lemon juice, and garlic. **Tahini** (a thick paste made from sesame seeds) and paprika can also be added. It's often eaten with pita bread, but may also be served with raw vegetables as a dip, or with whole-grain crackers. Try it as a spread on a sandwich or veggie wrap.

Chickpea Fun Facts

- This tasty legume is packed with protein for building and repairing muscles. It is also a good way to add folate and fiber to your snack for healthy blood cells and a healthy digestive tract.
- Chickpeas can count as a vegetable or protein food on ***MyPlate***.
- In the garden, chickpeas grow as seeds in pods on a bushy plant with feathery leaves. Their flowers can vary from white to violet. The chickpeas can vary in color from dark green to light brown, but they turn a light beige when cooked.
- Add chickpeas to your salad or try them mashed into a dip, like the hummus recipe below.

Recipe
Hummus

Serves: approximately 8

Ingredients:
- 2 15-oz cans of chickpeas (rinsed and drained)
- ½ cup water
- 2 cloves garlic (or 1 Tbsp minced)
- 2 tablespoons olive oil
- ¼ cup lemon juice
- ¾ teaspoon salt
- ¼ teaspoon black pepper
- ¼ cup tahini (*optional*)
- 1 tablespoon paprika (*optional*)

whole-wheat pita bread or raw vegetable sticks (for dipping)

PREPARATION TIME: 20 minutes

SERVING SIZE: ¼ cup

SUPPLIES: potato masher (or mortar and pestle), colander, large bowl, large stirring spoon, serving spoon, measuring cup and spoons, can opener

Note: *Adults may blend the hummus using a blender or food processor if available.*

Directions:

1. Wash your hands.
2. Use a potato masher, or a mortar and pestle, to mash chickpeas to a paste. Add garlic and enough water to make the mixture smooth. (Or you may use a blender or food processor with help from an adult.)
3. Add tahini (*optional*), olive oil, lemon juice, salt, and pepper to the chickpeas. Mix well.
4. Spoon hummus into a bowl. Sprinkle with paprika. (*optional*)
5. Serve with warm whole-wheat pita bread and vegetable sticks for dipping.

Recipe Vocabulary:

Potato Masher: a utensil used to mash soft food like mashed potatoes or applesauce

Mortar and Pestle: a two-piece tool (club-shaped piece and bowl) often made of wood or stone, used to grind or crush food

Mince: chop up into small pieces

Colander: bowl-shaped utensil with holes used to drain liquid from food (like pasta)

USDA United States Department of Agriculture

USDA is an equal opportunity provider and employer.

Garden Pen Pals

Name: _____ **Date:** _____

Connect with another class in your chosen area and make a friend by sharing what you both like to eat. Tell your "pen pal" about the fruits and vegetables you eat at home, at school, and at holidays. Ask them to share their favorite fruits and vegetables and how they prepare them. Swap pictures of your school gardens or your school lunches. What else would you like to learn about their eating habits, their school, or their culture?

Ask Your Pen Pal:

- What is your favorite fruit or vegetable, and why?
- Can you describe any special ways a fruit or vegetable is prepared where you live?
- What fruits and vegetables does your school serve for lunch?
- Do you ever eat chickpeas (garbanzo beans) or other beans? How does your family make these?
- What is your favorite recipe? Would you like to trade recipes?
- Does your school or family have a garden? What's growing in it?

Lesson 7: Chef Challenge

TOTAL TIME REQUIRED: 185 minutes / 3 sessions
Session 1: **Getting Started** 30 min (Math); **Activity I "Kitchen Measurements"** 40 min (Math)
Session 2: **Activity II "Taste Your Colors"** 40 min (English Language Arts)
Session 3: **Activity III "Chef Challenge"** 60 min (Health); **Reflect** 15 min

Key Message:

Taste a tomato, crunch a carrot, or savor a sweet potato. With their bright colors and flavorful tastes, they'll steal the show!

Subject Connections:

Math, English Language Arts, Health

Learning Objectives:

Students will be able to…

- Identify and choose appropriate units for liquid and dry food ingredients.
- Demonstrate an understanding of unit relationships (proportion) and fractions.
- Explain the amount of fruits and vegetables 5th and 6th graders need each day.
- Convert measurements and make calculations between units of volume and mass.

Supplies:

- Access to sink with warm, running water and soap
- **Garden Journals**
- Student handouts (pp. 82-84):
  1. ***Kitchen Measurement***
  2. ***Chef Challenge***
- ***Dig In!*** poster – ***Veggie Rock Stars***

Additional Supplies and Preperation:

See full instructions to the right.

Featured Fruits and Vegetables:

Carrot, Tomato, and Sweet Potato (baked)

Cut up and provide enough samples of raw carrots and tomatoes for students to try in the tasting activity on pp. 49-50, and enough to prepare the recipe on p. 84. Bake slices of sweet potatoes (discuss with school food service) or prepare a second variety of raw tomato. Provide water (and cups) for students to drink as they taste the vegetables.

LESSON OVERVIEW:

In this lesson, students will work with kitchen measurements, conversions, and calculations. They will use their math knowledge to prepare a recipe with red and orange vegetables. Students will discuss the recommended amount of fruits and vegetables kids need each day and explore physical activity in the garden.

ESSENTIAL QUESTIONS: *What tools or equipment do we use to measure liquids and solids? What units are used? How do we make conversions between units? How many fruits and vegetables do I need each day?*

ADDITIONAL SUPPLIES AND PREPARATION:

For Measurement Excercise (for every four to five students)

Dry beans, water (provide 2.5 cups per station), liquid and dry measuring cups, measuring spoons, a clear beverage cup with at least an 8-oz capacity, a plate, and a bowl. A variety of food and beverage containers (for example, dry ingredients – dry beans, canned vegetables, bag of rice; liquid ingredients – can of tomato sauce, bottled water, vegetable oil). Foods for measuring (optional): bag of baby carrots, bag of salad greens, strawberries, sample school lunch portions.

Equipment Needed for Recipe

Can opener, plates, forks, napkins, plastic gloves, and aprons (for each student)

Additional Ingredients for Rainbow Pasta Veggie Salad

Recipe on p. 84 serves 4; adjust as needed: cooked whole-grain spiral (rotini) pasta (rinsed and drained), a variety of rinsed vegetables (for example, chopped carrots, broccoli florets, green peas, chopped tomatoes, seeded and diced red or orange bell peppers, canned low-sodium chickpeas), light Italian-style dressing (olive oil and lemon juice can be used instead), salt and pepper. Optional: low-fat shredded mozzarella cheese, chopped cooked chicken.

TEACHING PROCEDURE:

GETTING STARTED (30 minutes, Math)

1. Explain that ***MyPlate*** provides information on how much people need to eat each day from each food group to be healthy and, for kids, to grow. Explain that the amounts of each food group people need each day depends on their height, weight, gender, age, and physical activity level. Ask: *How do you think your activity level affects the amount of food you need? How might it compare for athletes and nonathletes?*

Explain that people who are more active need more nutrients than people who are not active at all. Share with the class that most moderately active 5th- and 6th-grade students need **1½ cups of fruit** and **2½ cups of vegetables** each day. *Does that sound like a lot or a little?* Explain that an active 11-year-old girl or boy who gets more than 60 minutes of physical activity each day needs more: 2 cups of fruit and 3 cups of vegetables.

2. How much is a "cup" of vegetables? What does 1 cup of fruit look like? Show students the following measurements by using dry beans and water. Place the beans on a plate after measuring and the liquid in a clear beverage cup. Explain what counts as a cup of fruits and vegetables according to ***MyPlate***.
- **1 cup vegetables** = 1 cup of most raw or cooked vegetables or vegetable juice. Two cups of raw leafy greens counts as 1 cup of vegetables.
- **1 cup fruit** = 1 cup of fruit or 100% fruit juice. A half-cup of dried fruit counts as 1 cup of fruit.

3. Sometimes it's hard to know how much a portion is just by looking at it. Give students a better understanding by providing a variety of dry and liquid ingredients to measure. Divide the class into groups of four to five students per measuring station. Identify the equipment at each station: dry and liquid measuring cups, a set of measuring spoons, scale, plate, bowl, and dry and liquid ingredients (e.g., beans, water).

If possible, have students investigate the following (you may also try measuring portions from that day's school lunch, with assistance from school food service):
- How many baby carrots equal 1 cup? (*About 12*)
- How many cups of salad are in the portion you normally would serve yourself? (*Answers will vary; remember that 2 cups of salad greens are equivalent to 1 cup of vegetables from the* ***Vegetable Group***.)
- How many large strawberries equal 1 cup? (*About eight*)

How many cups of vegetables are in a portion served for school lunch? Of fruit? Encourage students to relate the way 1-cup and ½-cup portions look on a plate to the size of common objects. (For example, 1 cup of vegetables might appear like the size of a baseball.)

4. Ask students: *What are some ways you could eat 1½ cups of fruit during the day? How could you split this amount up into smaller portions at meals and snacks?* (*For example, ½ cup at breakfast, ½ cup at lunch, and ½ cup as an after-school snack.*) *What portion size of vegetables would you need to eat at meals and snacks to total up to 2 ½ cups for the whole day?* Remind students that one easy way to help ensure that they are getting enough is to **make half their plate fruits and vegetables** at meals. Explain that the ***MyPlate*** icon serves as a visual reminder to eat more fruits and vegetables at meals.

5. Ask students to think about why a person might need to use math and measurements when choosing which foods to eat or when preparing a meal in the kitchen. Ask if they have baked or cooked anything. Why is accurate measuring important? Invite students to share their ideas. Explain that proper measurement of ingredients ensures that a recipe comes out correctly. (For example, when baking bread, the correct amount of ingredients will make the bread dough rise and taste right.)

DIG DEEPER! MORE MATH IN THE KITCHEN (MATH)

Have students look up the amount of sodium and saturated fat in fruits and vegetables and compare it to amounts in salty snacks, such as chips. Use USDA's SuperTracker Food-a-Pedia to look up the nutritional content of various snacks: **http://www.choosemyplate.gov/foodapedia**.

CALCULATIONS IN THE GARDEN (MATH)

Extend your students' practice and understanding of measurements and volume into the garden. There are many ways to measure, collect, graph, and analyze data, including:

Track the growth rates of various plants. Measure how the plants grow week by week.

Record the temperature of the air and soil in fahrenheit and centigrade.

Measure the rainfall each week to determine the watering schedule.

Calculate the amount of fertilizer needed per quart and per liter of water.

ANSWER KEY: KITCHEN MEASUREMENT HANDOUT

1. Answers will vary – but 1 cup is roughly the size of a baseball.
2. Once in a mixing bowl, a dry cup may look different (more than a liquid cup) because dry ingredients take up more space.
3. 1.5 cups fruit/day = 360 mL (1.5 x 240) 2.5 cups vegetables/day = 600 mL (2.5 x 240)
4. 15.5-oz can of beans = 1.9 cups of beans with liquid (15.5 / 8)
5. 8-oz of cooked pasta = 1 cup cooked pasta
6. 1.5 cups fruit = 24 Tbsp (1.5 x 16)
7. 2.5 cups = 20-oz (2.5 x 8)
8. 32-oz = 2 lb (16 x 2)
9. Answers will vary according to package.
10. Answers will vary according to package.
11. Answers will vary according to package.

LEARNING ACTIVITIES

Activity I. Kitchen Measurements (40 minutes, Math)

Prepare: *Display a variety of food and beverage containers with labels for students to study. (For example, dry ingredients – dry beans, canned vegetables, bag of rice; liquid ingredients – can of tomato sauce, bottled water, and vegetable oil.)*

1. Write the following measurement abbreviations on the board: **mL, g, oz, Tbsp**. Do your students know what the abbreviations stand for? *(This step will help you assess prior knowledge.)* Next, write **"volume"** and **"weight"** on the board. Invite students to try to define each before you explain (see sidebar).

2. Distribute the ***Kitchen Measurement*** handout (pp. 82-83). Review the measurement abbreviations and discuss the differences and relationships between the U.S. (a.k.a. standard) and metric system.

3. Have students work in pairs to study the food and beverage containers provided. Do food packages include any units of measurement? Have them write down in their **Garden Journals** any units of measurement they find, and categorize them by **volume** or **weight**.

   Show how they can find measurements in at least two places: on the front of the package/container (*the Net Weight [Net Wt.] of the entire contents in ounces and grams)*; on the back or side of package/container (**Nutrition Facts label**). Ask them to notice any differences between the units of measurement of liquid and dry ingredients (see sidebar).

4. Explain that we look at the **Net Weight** of a food product when calculating the ingredients needed in a recipe. For instance, a recipe may call for 16 ounces of pasta or require a 15.5-ounce can of beans.

5. Sometimes, a recipe will use different measurement units. Conversions to another unit (for example, cups to milliliters) can be made by multiplying or dividing measurements. Ask students to first measure out 1 cup of liquid, then identify how many milliliters it is (*240 mL*). Next, give students 20 minutes to measure the liquid and dry ingredients and complete the math problems on their handout using the measurement and conversion chart.

6. As a review, ask students to demonstrate their understanding of this lesson by asking: *What is the difference between weight and volume? (Weight measures the heaviness of an object, and volume measures how much a container can hold or how much space an ingredient occupies.)* Hold up several packages or cans of food used in the lesson, one at a time. Ask: *What is the weight of this food? What is the volume of this food?*

The Nutrition Facts label: Point out the **Nutrition Facts label** and have students note the serving size and servings per package. Explain that people use this information to make healthy choices about food. The nutrition information on the label is for one serving of the food item. But the whole package of the food may contain more than one serving. (For example, a box of crackers might contain 30 crackers, but the "serving size" on the Nutrition Facts label is for only five crackers.) Explain that if people eat more than the serving size listed on the Nutrition Facts label, they are getting more of each nutrient listed on the label, which can include saturated fat and sodium (salt). So, if they eat two servings, they will be eating double the amount of saturated fat and salt listed on the label.

Sodium: While our bodies need sodium, too much is not good. Sodium (or salt) is added to foods for flavor and to preserve it. It's found in many processed foods such as chips, canned soups, lunch meats, and hot dogs.

Saturated Fats: These are types of solid fats that are solid at room temperature. They are found in foods such as hot dogs, bacon, regular cheese, whole milk, cakes, cookies, and other baked goods. Eating too much solid fat is not good for our hearts.

Activity II. Taste Your Colors (40 minutes, English Language Arts)

Prepare: *Rinse tomatoes, carrots, and sweet potatoes under cool, running water. Scrub carrots and sweet potatoes with a vegetable scrub brush. Peel the carrots and cut them up into sticks. Cut the tomatoes into small wedges or slices. Peel and slice a sweet potato into thin slices, then bake (if possible, ask for assistance from a local chef or school food service staff). If you cannot bake sweet potatoes to sample, provide two varieties of tomatoes to do a taste comparison (for example, a grape tomato versus a Roma tomato). Provide enough samples for each student on plates, along with forks and napkins. Provide drinking water in cups for students to sip between tastings.*

1. First, have students follow hand-washing procedures (see p. 5). Then, provide each student with samples of carrots, tomatoes, and sweet potatoes. Students should note the color, texture, and taste of each sample and record their observations in their **Garden Journals**. Before they begin tasting, remind them of the class **Tasting Etiquette Guidelines** (established in Lesson 1) and brainstorm appropriate vocabulary (descriptive adjectives) that will help them with their observations. (For example: crunchy, sweet, soft, creamy, hard, tangy, and tender). Have them divide a page, as shown below, using different columns to organize their notes. Encourage them to close their eyes and chew slowly to savor and observe the taste of each red and orange vegetable.

CARROT	Appearance	Texture	Flavor
TOMATO	Appearance	Texture	Flavor
SWEET POTATO	Appearance	Texture	Flavor

Teacher Tip! *Display the poster **Veggie Rock Stars** in a visible location in the classroom. Challenge students to identify the red and orange vegetables in the poster. How many have they tried? Can they identify any dark-green vegetables in this poster?*

*(**Note:** A list of all vegetables pictured in the poster can be found at: **http://teamnutrition.usda.gov/Resources/dig_in.html**)*

VOLUME

is the amount of three-dimensional space something occupies, or the amount an object can hold. Volume is measured in the following units:

Metric:
Teaspoon (tsp)
Tablespoon (Tbsp)
Cubic Centimeters/
Cubic Meters (cc/cm)
Milliliter (mL)
Liter (L)

U.S.:
Fluid Ounce (fl oz)
Pint (pt)
Quart (qt)
Gallon (gal)
Cup
Bushel

WEIGHT

is the heaviness, or downward force on an object caused by gravity. Weight is measured in the following units:

Metric:
Grams (g)
Kilograms (kg)
Tonnes

U.S.:
Ounces (oz)
Pounds (lb)
Tons

IMPORTANT FOOD SAFETY STEPS!

Please see p. 4 for a reproducible handout to post in a visible location in your classroom. It is important that you follow these steps to keep yourself, your students, and any parents or volunteers safe and healthy.

Hand Washing:
All persons participating in the food preparation activity (teachers, students, volunteers, parents) should wash hands before and after preparing, handling, or sampling foods.

Recipe

COOKING PASTA FOR RAINBOW VEGGIE PASTA SALAD

Prepare pasta according to package directions. Different types of pasta yield different amounts.

2. Ask students to share their observations. Have students share a meal or snack they have had that has at least one of the featured vegetables: **carrot, tomato, sweet potato**. Make a list on the board. Collaborate on additional ideas. Discuss preparation. (For example, can it be baked? Eaten raw? What goes well with it?)

Activity III. Chef Challenge (60 minutes, Health)

***Allergy Alert!** See p. 2 for more information on food safety and allergies before starting this food preparation activity.*

***Prepare:** Read through the **Chef Challenge** handout (p.84) and assemble the supplies and ingredients needed for the **Rainbow Veggie Pasta Salad** recipe your class will prepare, working in groups of four students. Cook, drain, and chill enough pasta in advance (see sidebar), and have an assortment of colorful vegetables chopped up ahead of time. As an additional option, provide chopped grilled chicken and low-fat shredded cheese. Ask food service staff or parents for assistance.*

1. Divide the class into groups of four to five students. Distribute the ***Chef Challenge*** handout (p.84) with a recipe for ***Rainbow Veggie Pasta Salad.*** Explain that students will work in teams to prepare the recipe featuring colorful fruits and vegetables of their choosing. Have students read through all the instructions, and assess their stations to make sure they have what they need. Have students discuss what colorful vegetables they want to include.

2. Explain that they will first need to note and adjust the yield of the recipe to the number of students in their group, according to whether they are cooking for the entire class or cooking for a smaller group of students. They will need to also adapt the measurements of the ingredients. They should write down their new measurements on the handout.

3. Review the food safety and preparation steps carefully with students before cooking begins (see pp. 4-5). After they have washed their hands and put on aprons and plastic gloves, have them begin the preparation of their recipe. Arranging th ingredients in an assembly line will make the process easier and allow everyone in the group to participate.

4. When they finish preparing their salad, have students clean up their stations, throw away waste or compost the food scraps in the school garden's compost bin, and wash the dishes and all surfaces (including utensils and appliances) carefully with hot, soapy water.
   Note: *If refrigeration is possible, cover and set aside the completed recipes to taste later. If not, save cleanup for after the next step.*

5. Celebrate by sharing and eating the prepared pasta salad recipes together as a class. Have students wash their hands before eating. Provide each student with a plate and fork and a small sample of each dish. Have students write down, either in their **Garden Journals** or on index cards, their thoughts about each recipe dish using the following questions:
   Recipe:
   - Featured red and orange vegetable:
   - Additional vegetables:

   Taste:
   - What do you like about this recipe?
   - Do you have an idea of how it could be improved?

Ask students to share their thoughts with the class. Encourage students to say one compliment about each dish, starting with the phrase, *"My compliments to the chef! Your dish was…."*
Note: *Make sure to document the process and the final presentations – this activity will guarantee some great photos!*

REFLECT (15 minutes)

Ask students to reflect in their **Garden Journals** on the following questions, then share with the class for a discussion: *Why is it important to eat the recommended amounts of fruits and veggies each day? How do the different parts of a meal work together? Which red and orange vegetable do I eat the most? What surprised me the most about the recipe I made and tasted in class?*

EXTENSIONS

Cafeteria Scale. Have students interview the school Food Service Director to learn how to calculate the amount of a particular fruit or vegetable prepared in the cafeteria each day. For instance, how much spinach is needed to make salads for the school lunch? How many salads does this amount make? How much spinach is in each salad? How does that compare to the volume of what the student might prepare at home? Students will find the difference in scale astonishing!

ACTIVE GARDENING (PHYSICAL EDUCATION)

Just as there are recommended daily servings of fruits and vegetables, there's a recommended amount of physical activity that kids need each day, and that's at least 60 minutes – most of which should really get your heart beating. Everything counts – even short bursts of activity throughout the day will add up!

GARDEN TEAMS

There are many ways to be active in the garden. Have students think about and create a list of gardening tasks that gets them moving (*for example, weeding, raking, shoveling, watering, pushing a wheelbarrow, planting*). Assign garden teams to a task. Students should spend approximately five minutes performing each, and then rotate with another team so that they are given an opportunity to engage in all tasks. Host a garden-themed "field day" with fun activities like a wheelbarrow race, grasshopper jump, or water-can relay.

Kitchen Measurements (Page 1 of 2)

Are you surprised that math is used in the kitchen? Chefs need to measure ingredients to make sure their recipes come out tasting right and are the same each time. There are different units of measurements for liquid and dry ingredients. There are also different measuring systems depending on where you are in the world – **U.S.** (also called "**standard**") and **metric**. Use the table below as a reference to help you in your kitchen measurements.

Weight: the heaviness, or downward force on an object caused by gravity

Weight Measurement Abbreviations

g = gram
lb = pound
oz = ounce (weight)

Volume: the amount of 3-dimensional space something occupies, or the amount an object can hold

Volume Measurement Abbreviations

mL = milliliter
L = liter
fl oz = fluid ounce
gal = gallon
tsp = teaspoon
Tbsp = tablespoon
qt = quart
pt = pint

Cooking Measurements

U.S.-to-Metric System

Cooking Equivalents

1 tbsp = 3 tsp
1/16 cup = 1 Tbsp
1/8 cup = 2 Tbsp
1/6 cup = 2 Tbsp + 2 tsp
1/4 cup = 4 Tbsp
1/3 cup = 5 Tbsp + 1 tsp
3/8 cup = 6 Tbsp
1/2 cup = 8 Tbsp
2/3 cup = 10 Tbsp + 2 tsp
3/4 cup = 12 Tbsp
1 cup = 16 Tbsp
1 cup = 48 tsp
1 cup = 8 oz
2 cups = 1 pt
2 pt = 1 qt
4 cups = 1 qt
4 qt = 1 gal
16 oz = 1 lb

U.S.-to-Metric System

Converting Fluids

1/5 tsp = 1 mL
1 tsp = 5 mL
1 Tbsp = 15 mL
1 fl oz = 30 mL
1/5 cup = 50 mL
1 cup = 240 mL
2 cups (1 pt) = 470 mL
4 cups (1 qt) = .95 L
4 qt (1 gal) = 3.8 L

Metric System to U.S.

Converting Fluids

1 mL = 1/5 tsp
5 mL = 1 tsp
15 mL = 1 Tbsp
30 mL = 1 fl oz
47 mL = 1/5 cup
100 mL = 3.4 fl oz
237 mL = 1 cup
474 mL = 2 cups
.95 L = 4 cups
3.8 L = 4 qt (1 gal)
1 L = 34 fl oz
1 L = 4.2 cups
1 L = 2.1 pt
1 L = 1.06 qt
1 L = .26 gal

Converting Weight

1 g = .035 oz
100 g = 3.5 oz
500 g = 1.10 lb
1 kg = 2.205 lb
1 kg = 35 oz

U.S.-to-Metric System

Converting Weight

1 oz = 28 g
1 lb = 454 g

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Kitchen Measurements (Page 2 of 2)

Name: _____ **Date:** _____

Most moderately active 10- to 11-year olds need:

Fruit: 1½ cups per day **Vegetables: 2½ cups per day***

***Remember!**

The amount of fruits and vegetables you need each day is determined by your age, gender, height, weight, and how active you are.

What counts as 1 cup of fruits or vegetables?

=

- **small bowl (8-oz) of veggies**
- **2 cups of raw leafy greens**
- **8-oz glass of 100% fruit juice**
- **small bowl (8-oz) of fruit**
- **½ cup of dried fruit**

Use measuring tools to test your kitchen math skills:

1) Measure 1 cup of dry beans to see what 1 cup looks like. Put a cup of beans on a plate. Then, put 1 cup of beans in a bowl. Describe the size of a cup by comparing it to a familiar object: _____

2) Measure 1 cup of water and pour it into a drinking glass.
Is there a difference between what a liquid "cup" and a dry "cup" look like? _____

3) Measure out following, then convert the daily recommended amounts to milliliters: _____

1½ cups fruit/day = _____ mL

2½ cups vegetables/day = _____ mL

Convert the following measurements:

4) 15½-oz can of beans = _____ cups

5) 8-oz of pasta = _____ cups

6) 1½ cups of fruit = _____ Tbsp

7) 2½ cups of chopped tomatoes = _____ oz

8) 32-oz of green beans = _____ lb

Find three measurements on a food or beverage package to convert to another unit.

9) _____ = _____

10) _____ = _____

11) _____ = _____

Chef Challenge

Name: _____ **Date:** _____

Red and orange veggies can be smooth, sweet, cool, or zippy. Taste a tomato, crunch a carrot, or savor a sweet potato. With their bright colors and flavorful tastes, they'll steal the show!

You are part of Team _____ (name) and are competing in the **Chef Challenge**. Using the fruit and vegetable ingredients, you will work together to prepare the following recipe and then arrange it on a plate to make it look especially appetizing!

1) Before you begin, read through your recipe. What supplies do you need? _____

What are the preparation steps? _____

_____

2) Next, look at the recipe serving size. How many people are in your class? _____

Make the necessary calculations to the ingredient measurements to adapt the recipe so that there's enough for everyone.

3) How many cups of vegetables does this recipe provide per serving? (**Hint:** Add together the cups of vegetables in the recipe, then divide by the number of people it serves.) _____

4) What colorful vegetables do you want to include in your pasta salad? Work together with your fellow chefs to measure and prepare your unique pasta salad.

_____

Recipe

Rainbow Veggie Pasta Salad

Ingredients:
- 1 cup cooked whole-grain spiral (rotini) pasta
- ½ cup fresh carrots, chopped
- ½ cup fresh broccoli florets
- ½ cup green peas
- ½ cup fresh tomatoes, chopped
- ½ cup red or orange bell peppers, seeded, diced
- 1 cup canned low-sodium chickpeas, rinsed, drained
- 1 cup low-fat shredded mozzarella cheese (optional)
- 1 cup cooked chicken, chopped (optional)
- 1 cup of light Italian-style salad dressing*
- 1 Tbsp salt and pepper

(*Or make your own dressing using equal parts olive oil and lemon juice.)

Preparation Time: 15 minutes
Serves: 4
Serving Size: 1½ cups

SUPPLIES:
- large bowl
- large spoon
- vegetable peeler
- can opener
- dry measuring cups (½ cup and 1 cup)

Directions:

1) In a large bowl, combine cooked pasta, whatever combination of vegetables you choose, cheese and/or chicken (if using), and dressing. Mix gently with a spoon.

2) If possible, refrigerate for at least 1 hour before serving. Otherwise, enjoy right away!

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Lesson 8: Fruits and Veggies Many Ways

TOTAL TIME REQUIRED: 120 minutes / 3 sessions
Session 1: **Getting Started** 10 min;
Activity I "Fantastic Fiber" 20 min (Health/Science)
Session 2: **Activity II "Fiber Investigation"** 40 min (Health/Science/English Language Arts/Math)
Session 3: **Activity III "Fabulous Fruit"** 40 min (Health); **Reflect** 10 min

Key Message:

Fresh, frozen, canned, and dried fruits and veggies can all be healthy choices. Try fruit at breakfast and as a snack.

Subject Connections:

Math, Science, Health, English Language Arts

Learning Objectives:

Students will be able to…

- Describe the health benefits of dietary fiber.
- Identify fruits and vegetables that are high in dietary fiber.
- Discuss ways to enjoy fruit at breakfast and as snacks.

Supplies:

- Hand juicer, 8-oz clear plastic cups, plastic bowls, plastic gloves, aprons, spoons (per student)
- Access to sink with warm, running water and soap
- **Garden Journals**
- Student handouts (pp. 85-86):
  1. ***Finding Fiber***
  2. ***Fabulous Fruit***
- ***Dig In!*** poster: ***Roller Coaster***

Featured Fruits and Vegetables:

Strawberry
Provide enough cut-up samples to use in the activity on pp. 54-55.

Additional Foods:

One orange cut in half. (Optional: If making a juice for students to try, use more oranges.) The recipe on p. 86 serves two; adapt as needed: Variety of precut fruits (choose high-fiber fruits such as: oranges, strawberries, pears, apples, kiwi, dried fruit); low-fat yogurt; low-fat granola. Provide water (and cups) for students to drink as they taste the foods.

LESSON OVERVIEW:

Students will discuss different ways to preserve the harvest – freezing, canning, and drying. This ensures that fruits and vegetables are always available, whether between shopping trips or when fresh produce is out of season. Students will explore differences in the fiber content of fruits and vegetables and discover tasty ways to enjoy fruit at breakfast and as snacks.

ESSENTIAL QUESTIONS: *What is fiber, what does it do for me, and where can I find it? How can I tell if a food is more nutritious?*

TEACHING PROCEDURE:

GETTING STARTED (10 minutes)

1. Eating fruits and vegetables picked fresh from the garden is just one way that produce can be eaten. Ask students to suggest other forms of fruits and vegetables. Explain that while fresh produce is tasty, so are other forms of fruits and vegetables. Frozen, canned, and dried fruits all count toward the **Fruit Group**, and 100% fruit juice does as well. The same goes for vegetables: they can be frozen, canned, or dried. 100% vegetable juice counts toward the **Vegetable Group** too.

2. Ask students to name some advantages to frozen, canned, or dried fruits and vegetables. *(You can have fruits and vegetables on hand between trips to the store, you can enjoy certain fruits and veggies when they are no longer in season; they don't spoil like fresh.)*

3. Remind students about the **food system** and the steps that a food takes from farm to plate (see sidebar, p. 53). One of the steps of the food system is **processing**. Ask students if anyone remembers what happens in this step, and when.

4. Processing happens after production (*i.e., when a fruit or vegetable is grown and harvested*). Explain that food processing changes food from its original form. The food might be changed to make it easier to eat, such as peeling and slicing an apple, or bagging prewashed salad. Processing can also be done to **preserve** food so we can still eat it after the growing season has ended. Common preservation methods are: **canning**, **drying**, or **freezing**.

5. Have students reflect on the different ways fruits and vegetables can be eaten. How might they change from the garden to the plate? Ask students to think about how fruit might become fruit juice. Demonstrate juicing an orange, or have students help you using a hand juicer. Ask students to identify what is left behind in the orange that is not part of the fruit juice. (*Parts of the fruit that separate the orange into sections; membranes that contain fiber.*) We eat more of the orange when eating slices rather than when drinking the juice. Ask students if they think this might affect the nutrients found in juice as compared to the whole fruit.

LEARNING ACTIVITIES

Activity I. Fantastic Fiber (20 minutes, Health/Science)

1. Write the word **fiber** on the board, and ask students if they know what it is or what it does for the body. Do they know any foods that have fiber? Do meats or dairy foods have fiber? Explain that fiber is found only in plant foods *(i.e., fruits, vegetables, whole grains).* It is not found in animal foods like meat and dairy. Some fiber comes from the parts of the plant that help it keep its shape and give it structure, like the individual sections you see in an orange or the skin on a potato. It's also in the small seeds you might eat as part of the fruit, such as in a strawberry or kiwi fruit. Fiber naturally occurs in many fruits and vegetables. Beans and peas are an excellent source.

2. So how does fiber work? What does it do? One of the ways fiber helps the body is to act like a scrub brush or broom, moving food along through the digestive tract. Fiber also helps the body feel full longer after eating. ***Note:*** *Visually demonstrate the process showing a bottle brush in a paper-towel roll.*

Activity II. Fiber Investigation (40 minutes, Health/Science/English Language Arts/Math*)

See p. 54 for Math connection.

1. In this activity, students will practice reading the **Nutrition Facts label** to determine the amount of fiber in ½-cup portions of various fruits and vegetables. The Nutrition Facts label is usually found only on packaged foods (*i.e., canned, frozen, and dried fruits and vegetables*) and not fresh produce. Labels for some fresh fruits and vegetables have been provided on the student handout to give students experience in comparing fruits and vegetables. You may also use the USDA's online **SuperTracker, Food-a-Pedia (https://www.supertracker.usda.gov/foodapedia.aspx)** to find out how much fiber is in various foods.

Teacher Tip! *A brief video tour on how to use* ***Food-a-Pedia*** *is available at* ***https://www.supertracker.usda.gov/sitetour.aspx*** *(see Section 4 of the User Guide). Alternatively, Team Nutrition also has* ***Nutrition Facts labels*** *for fruits and vegetables that you can print and use in class. Find them at:* ***http://teamnutrition.usda.gov/NutritionLabels.pdf****.*

VEGGIES MANY WAYS

Fresh, frozen, and canned vegetables are all nutritious choices. A vegetable that is ripe when harvested and frozen soon after can actually have more vitamins and minerals than a fresh form of the vegetable that's been picked before it's ripe and/or stored for a long time. For some vegetables, heating can actually make certain nutrients easier for the body to absorb and use.

REVIEW THE FOOD SYSTEM

Provide an overview of these five steps in the food system:

Production: Farmers produce fruits and vegetables by growing them on their farms.

Processing: The fruits and vegetables are processed before they are sold. The food can be washed, cut, mixed, and packaged to preserve it or make it more appealing *(i.e., tastier or easier to use*) for the customer.

Distribution: When the food has been processed, it is ready to be distributed to stores and is transported by airplane, truck, or train.

Consumption: After customers buy the food, they consume it by eating it cooked or raw.

Composting/Recycling: Uneaten food scraps are disposed of (either composted to return nutrients to the soil or sent to a landfill).

DIG DEEPER!

Have students take their fruit investigations further. They can:

- Count how many times they see ads for fruits and vegetables during their favorite television show or in their favorite magazine. Have students compare the number of these ads to ads for other food products. Is there a difference? Ask students to speculate how the frequency of ads for different foods might influence behavior and health.

FIND THE FIBER

Remind students that people need to eat different types of fruits and vegetables to get all of the nutrients their bodies need for good health. Different fruits and vegetables contain different nutrients. Some fruits and vegetables are higher in fiber than others. In the case of 100% juice, the fiber has been removed during processing. Remember what was left behind in the orange after juicing? (*The membranes that provide the fiber.*) That's why nutritionists recommend that most of the fruits and vegetable you eat come from whole or cut-up fruits instead of juice.

FIBER GRAPHS (MATH)

After students have completed their investigations, have them graph the amount of fiber in various fruits and vegetables using information from Nutrition Facts labels (from the handout or elsewhere) or USDA's online **SuperTracker Food-a-Pedia (http://www.choosemyplate.gov/foodapedia)** Ask: Do all fruits and vegetables have the same amounts of fiber? *(No, the amount of fiber varies, which is why you need to eat a variety.)*

Ways To Process a Food:

Fresh-cut: to cut, peel, or shred fresh fruits and vegetables prior to packaging. Fresh-cut products do not require additional preparation, processing, or cooking before they are eaten. Baby carrots and apple slices are examples.

Juice: to extract (take out) the juice from a food. Orange juice and tomato juice are examples.

Cook: to heat a food to prepare it for eating. Tomato sauce and applesauce are examples.

Preserve: to keep food safe to eat for a longer period of time. Canned, frozen, and dried fruits and vegetables are examples.

Ways To Preserve a Food*

Freeze: to have the liquid in a food change to a solid because of extreme cold

Can: to store food in a can or jar that has been heated and sealed to prevent spoilage

Pickle: to preserve food in vinegar, brine, or another liquid

Dry, or Dehydrate: to preserve food by removing the water from it

***Note:** This is not a complete list of preservation techniques.*

2. Distribute the ***Finding Fiber*** handout (p. 85) and divide the class into pairs. Direct students to look at the top-left label *(A)*. Invite students to share what information they notice and explain what they think it means. Can students identify any of the following on the label?

   Serving Size: Ask for students to look for the words "Serving Size" on the first label (100% Apple Juice). In this example, the serving size is 4 fluid ounces, equivalent to ½ cup. Explain that the information on the label is based upon one serving.

   Fiber: Students can tell the amount of fiber in the food by looking at the grams of fiber on the label. The label also provides the **percent daily value** (%DV). The %DV is a number that tells you if there is more or less of a daily recommendation of something in a serving of the food. A %DV of 5% or less is low; 20% or more is high. Choose foods that are higher in fiber. ***Note:** All serving sizes on the Nutrition Facts labels on the handout are equivalent to ½ cup of fruit.*

3. Which foods contain the most fiber? *(The whole orange and apple slices contain the most fiber.)* Which has more fiber: a whole orange or orange juice? *(The whole orange.)* An apple or apple juice? *(Apple.)* What does this tell you about the amount of fiber in juices verses whole or cut-up fruit? *(Whole fruit contains more fiber than juice. Juice contains little fiber.) Were all of the whole or cut-up fruits high in fiber? (No, different fruits have different nutrients, which is why you need to eat a variety.)*

Activity III. Fabulous FRUIT (40 minutes, Health)

***Allergy Alert!** See p. 2 for more information on food safety and allergies before starting this food preparation activity.*

Prepare: *Set up several stations, each with a serving spoon, with samples of cut-up fruit in different containers (choose high-fiber fruit – for example, oranges, strawberries, pears, apples, kiwi, any dried fruit), low-fat yogurt, and low-fat granola (or oatmeal). Provide each station with plastic gloves, plastic cups, spoons, and napkins.*

1. Tell students that fruit can be a delicious way to add fiber to their breakfast or snack. Explain that the fiber will help them feel full until their next meal so they can focus on school or sports. Students will prepare a recipe featuring fruit in this activity. First, they should wash their hands following the correct procedures (see pp. 4-5 for important food safety and hand-washing reproducible).
2. Distribute the handout ***Fabulous Fruit*** (p. 86). Divide students into groups of five and direct them to a fruit station. Give each student a plastic glove, apron, and a plate and/or cup. Have them follow the instructions to create the ***Breakfast Sundae*** recipe. Each student will create one fruit compote sundae that he or she can eat as a snack or at breakfast. Encourage them to be creative by layering the ingredients.
3. As soon as students are finished, they may sit down and eat their sundaes. Invite students to share what they liked about the process and how they liked their snacks. Ask: *Which fruit was your favorite? Did you try a new fruit? How did the combination of the ingredients enhance the flavor of each? Would you ever try this recipe again? Why or why not?*

REFLECT (10 minutes)

Have students reflect in their **Garden Journals** about the foods they eat. Ask: *How much is processed? How many whole fruits and vegetables do you eat each day? How can you get more fiber? Are there any snacks you eat during the day that can be more nutritious? How can you eat more fruits each day?* Have students write down three tips and then share them with the class.

EXTENSIONS

Fruity Offerings. If your school offers breakfast, have students look at the menu and identify what types of fruits are offered. Students may survey their classmates to find out what fruits they'd like to be served more often. Are there any suggestions or requests they can make to the food service staff/director?

Local Harvest. Ask local fruit and vegetable farmers to talk with the class about how their produce might be processed after harvest. For instance, carrots from local growers might be washed, sliced, and frozen for use in school meal programs.

Healthy Snack Track! Have students track their snacks for a week. Did any of their snacks include fruits and vegetables? What are some ways they could eat more fruits and vegetables as snacks?

Poll the Favorites. Have students interview teachers, coaches, and school administrators to find out their favorite fruit or vegetable snack. Create a bulletin board showing the results.

Shop Fruits and Veggies. Have students review their family's shopping list for the week. Does it include a variety of fruits and vegetables? Are there fresh, frozen, canned, and dried fruits and vegetables on the list?

PICKING AND STORING YOUR GARDEN HARVEST

Have your **Garden Teams** check the garden to see if any fruits and vegetables are ripe enough for harvest. Encourage students to use care not to break, scrape, or bruise fruits and vegetables when harvesting. The less that fruits and vegetables are handled, the longer they will last in storage. **(pp. 104-105)** Harvest only produce of high quality. Rotting produce and produce infested with insects should not be used. Use cleaned and sanitized food-grade containers, such as plastic bins or buckets, to hold harvested produce. Most garden produce should be refrigerated immediately after harvest, unless it is normally held at room temperature *(such as tomatoes).*

Finding Fiber

Name: _____ **Date:** _____

There are many ways to eat fruits and vegetables, including raw, canned, frozen, dried, and juiced. Study the **Nutrition Facts labels**, and compare each to find the option with the most fiber. Answer the questions to the right, in your **Garden Journals**.

1) Which food contains the most fiber?

2) Which has more fiber: a whole orange or orange juice?

3) Which has more fiber: apple slices or apple juice?

4) What can you conclude about the amount of fiber in juice versus whole or cut-up fruit?

100% Apple Juice

Nutrition Facts
Serving Size 4 fl ounces (1/2 cup)

Amount Per Serving	
Calories 55	Calories from Fat 0
	% Daily Value*
Total Fat 0g	**0**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 0mg	**0**%
Total Carbohydrate 14g	**5**%
Dietary Fiber 0g	**0**%
Sugars 12g	
Proteins 0g	

Vitamin A 0% • Vitamin C 2%
Calcium 2% • Iron 0%

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

Apple Slices

Nutrition Facts
Serving Size 1/2 cup

Amount Per Serving	
Calories 30	Calories from Fat 0
	% Daily Value*
Total Fat 0g	**0**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 0mg	**0**%
Total Carbohydrate 8g	**3**%
Dietary Fiber 2g	**8**%
Sugars 6g	
Proteins 0g	

Vitamin A 0% • Vitamin C 4%
Calcium 0% • Iron 0%

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

100% Orange Juice

Nutrition Facts
Serving Size 4 fl ounces (1/2 cup)

Amount Per Serving	
Calories 60	Calories from Fat 0
	% Daily Value*
Total Fat 0g	**0**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 0mg	**0**%
Total Carbohydrate 14g	**5**%
Dietary Fiber 0g	**0**%
Sugars 10g	
Proteins 1g	

Vitamin A 0% • Vitamin C 70%
Calcium 2% • Iron 0%

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

Whole Orange

Nutrition Facts
Serving Size 1 small orange (2-3/8" diameter)

Amount Per Serving	
Calories 60	Calories from Fat 0
	% Daily Value*
Total Fat 0g	**0**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 0mg	**0**%
Total Carbohydrate 15g	**5**%
Dietary Fiber 3g	**13**%
Sugars 12g	
Proteins 1g	

Vitamin A 4% • Vitamin C 90%
Calcium 4% • Iron 0%

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

Fabulous Fruit

Name: _____ **Date:** _____

Fuel your day with fruit at breakfast! Try some of these tasty ideas:

- Add chopped apples, dried fruits, chopped nuts, and a little brown sugar to plain oatmeal.
- Top a whole-grain waffle with low-fat yogurt and berries.
- Spread peanut butter on a whole-wheat tortilla. Top it with fruit and a grated carrot, then roll it up.
- Top whole-grain bread with low-fat cheddar cheese and apple slices. Ask your parents to toast it in the oven.
- Blend low-fat yogurt, fruit, and ice in a blender for a quick smoothie.

Power up with fruit as a snack. Try the following ideas:

- Create your own cereal snack mix with whole-grain cereal, dried fruits, and nuts.
- Enjoy orange wedges after sports practice.
- Dip fruits into low-fat vanilla yogurt.
- Make popsicles out of low-fat yogurt and fruit.

Make your own fruit treat! Work with a partner and follow the recipe below to make a yummy breakfast or power snack. Don't forget to wash your hands first!

Recipe
Breakfast Sundae

Ingredients:
- 2 cups low-fat granola cereal
- 1 cup low-fat yogurt
- 1 cup fruit, chopped

Supplies:
- 1 tablespoon
- measuring cup
- 3 bowls
- 2 8-oz clear cups

Preparation Time: 10 MInutes
Serves: 2
Serving Size: 8 oz

Directions:
1. Use a measuring cup to measure out the ingredients and place each in a separate bowl.
2. Using a spoon, layer the granola, yogurt, and fruit into 2 plastic cups.
3. Get creative! Alternate colors. Try a variety of fruits.
4. Refrigerate or enjoy right away.

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Lesson 9: Making Healthy Choices

TOTAL TIME REQUIRED: 150 minutes / 3 sessions
Session 1: **Getting Started** 10 min;
Activity I "The Power of Choice" 40 min (Health/Science)
Session 2: **Activity II "Fruit Imposters"** 20 min (Health/Science);
Activity III "Melon Fruit Salsa" 40 min (Health)
Session 3: **Reflect** 40 min (English Language Arts)

Key Message:

Make half your plate fruits and vegetables. Read the food label to make choices that are lower in solid fats, added sugars, and sodium (salt).

Subject Connections:

Science, Health, English Language Arts

Learning Objectives:

Students will be able to…

- Summarize a variety of nutritious food choices in the Fruit and Vegetable Food Groups.
- Identify foods that are higher and lower in sodium, added sugars, and solid fats.
- Summarize the benefits of limiting the consumption of solid fats, sodium, and added sugars.
- Differentiate between fruit drinks and 100% fruit juice.

Supplies:

- 1 large mixing bowl, serving spoon, 8-oz plastic cups, spoons, napkins (per student)
- Access to sink with warm, running water and soap
- **Garden Journals**
- Student handouts (pp. 87-89):
  1. ***The Power of Choice***
  2. ***Fruit Imposters***
- ***Dig In!*** posters – **All six of them**

Featured Fruits and Vegetables:

Cantaloupe
Provide enough samples for tasting as required by recipe in sidebar on p. 59.

Additional Foods:

The recipe on p. 59 serves 12; adjust as needed: chopped melon, cucumber, green bell pepper, cilantro or fresh mint, lemon or lime juice. Optional: jalapeño pepper, whole-wheat pita chips. Provide water (and cups) for students to drink as they taste the foods.

LESSON OVERVIEW:

In this lesson, students discover how solid fats, sugars, and sodium can be added to fruits and vegetables during processing and how to make informed and healthy choices. Students will prepare a Melon Salsa that tastes sweet without having any sugar added to it.

ESSENTIAL QUESTIONS: *How can I make a healthy choice? Which fruits and vegetables should I eat more of? How can I inspire others to make healthy choices too?*

TEACHING PROCEDURE:

GETTING STARTED (10 minutes)

1. Ask students to think about what makes certain foods healthier choices than others. Are there certain food choices within the **Fruit** and **Vegetable Groups** that people should eat more often than others? (For example, an apple versus an apple pie, carrot sticks versus onion rings fried in solid fat.)

2. Encourage students to consider what may happen to fruits and vegetables as they are processed. (Refresh from Lesson 8.) What sort of ingredients might be added to foods during this step? Let students hypothesize and suggest answers. The following activity will explore this further.

LEARNING ACTIVITIES

Activity I. The Power of Choice (40 minutes, Health/Science)

1. Ask if anyone has heard of the term "**calories**." Explain that calories are a measure of the amount of energy that the body gets from foods, just as grams and pounds are a measure of weight. Ask students if they can think of any ways the body uses the energy from food. *(The body needs energy for processes like keeping your heart beating and digesting food. It also uses energy to fuel physical activity like running and jumping. Kids use energy for growth.)* Explain that the body needs the energy it gets from foods and drinks to be healthy. But, when the body takes in too many calories (energy), it stores the calories as fat. Foods high in solid fats and added sugars are often higher in calories. Balancing the energy the body gets from food with the energy used in physical activity is important for keeping a healthy body weight.

2. Explain that every food group contains foods you should eat more of than others. Fruits and vegetables are naturally low in calories, **added sugars**, and **solid fats** – which makes them healthy choices. However, **sugar** and **solid fat** is sometimes added to fruit and vegetable foods during processing or preparation. This can make these foods higher in extra calories that the body does not need.

3. Sugar is sometimes added to canned and frozen fruits and to fruit drinks. Ask students if they can think of any examples. (For example, sweetened applesauce, fruits canned in heavy syrup, or raisins with a candy coating.) You can find added sugars by looking at the ingredients list on the food package. Some other names for added sugars are: **high-fructose corn syrup, sugar, sucrose, dextrose, fructose, lactose, maltose, honey, anhydrous dextrose, brown sugar, confectioner's powdered sugar,** and **corn syrup.** If one of those is listed among the first three ingredients, you can be sure that added sugar is a major ingredient. For canned fruits, look for fruits that are canned in 100% juice or water and not syrups.

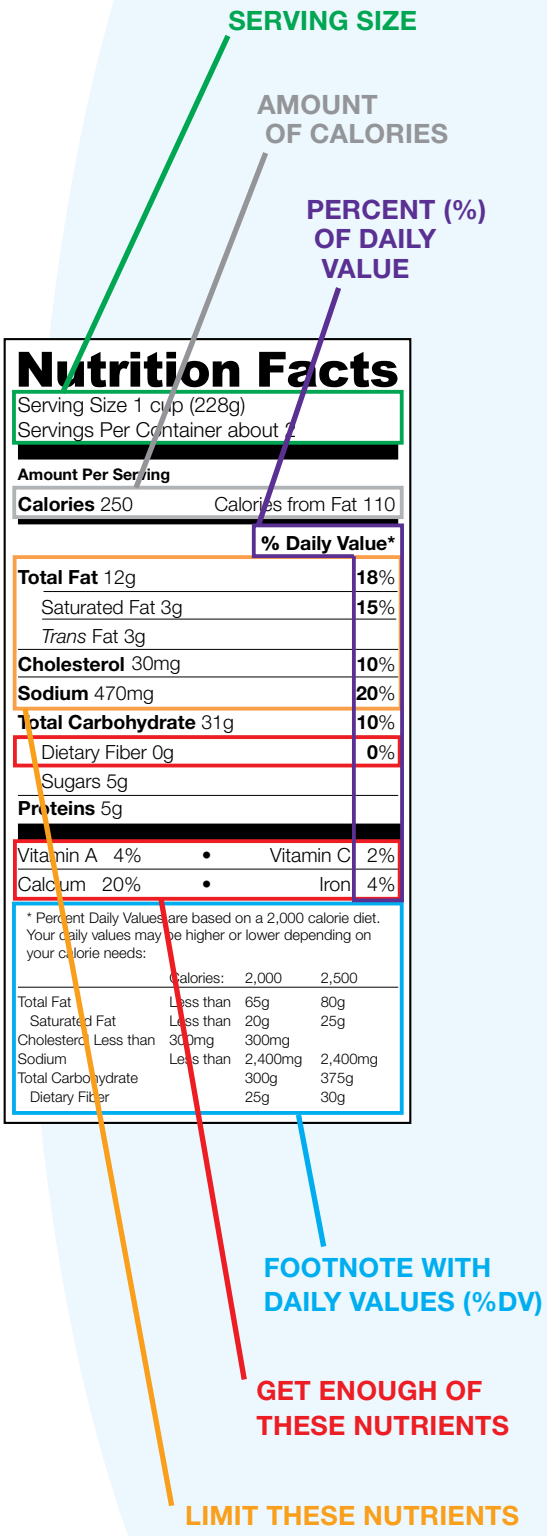
4. **Solid fats**, such as **butter**, **lard**, and **shortening**, are sometimes added when vegetables are prepared *(such as frozen vegetables with sauces or cheese, or vegetables that are fried in solid fat like some French fries).* Eating too much solid fat is not good for your heart.

5. **Sodium**, also known as **salt**, is often added to foods during processing. While the body needs some salt, almost everyone eats more salt than the body needs. Too much salt plays a role in high blood pressure, which makes it harder for the heart to do its job. Ask students if they can think of any processed vegetable foods that can be high in salt. (For example, soups, French fries, olives, canned vegetables, tomato juice.) When choosing canned vegetables, it helps to look for foods labeled **"low sodium," "reduced sodium,"** or **"no salt added."**

6. Now that students know why it's important to eat fruits and vegetables that are lower in solid fats, sodium, and added sugars, ask if they have any ideas on how they can make better choices. Accept all answers. If no one suggests reading the food packaging ingredients list or **Nutrition Facts label**, ask students if anyone has ever noticed and looked at one before (or if they recall it from previous lessons). Hold up a container of packaged food (for example, a can of soup), and point to the **Nutrition Facts label** and ingredients list.

7. Next, distribute the handout ***The Power of Choice*** (pp. 87-88) and divide the class into pairs. Direct the class to look at the first label *(Applesauce With Sugar)*. Invite students to share what information they notice and explain what they think it means. Can students identify any of the following from the label?

   Serving Size: Ask for students to look for the words "**Serving Size**" on the label. In this example, the serving size is ½ cup. How many servings would it be if they were to eat everything in the package? The information on the label is based on one serving. Explain that if they were to eat more, they would need to multiply the nutrient information by the number of servings they ate.



IMPORTANT FOOD SAFETY STEPS!

Please see p. 4 for a reproducible handout to post in a visible location in your classroom. It is important that you follow these steps to keep yourself, your students, and any parents or volunteers safe and healthy.

Hand Washing:
All persons participating in the food preparation activity (teachers, students, volunteers, parents) should wash hands before and after preparing, handling, or sampling foods.

EXTENSIONS

Lunch Line Promotions
Work with the cafeteria food service staff to add images and signs in the food line highlighting different fruits and vegetables.

Garden Ads
Create posters to display around the school promoting what's growing in the garden, to inspire the rest of the school to try more fruits and vegetables. Include facts, colorful images or photographs of fruits and vegetables, and some favorite ways to eat them. It's also a great way to spread the word about the garden to get support, and volunteers! **(p. 100)**

Community Action
Visit other schools to allow for your students to peer-teach other students how to garden and how to eat more fruits and vegetables. Support your community by hosting a food drive focusing on fruits and vegetables to donate to a local food pantry or homeless shelter. Check to see if the pantry will accept donated produce from your garden.

Calories: Next, have students find the number of calories in a single serving of the sweetened applesauce and the unsweetened applesauce. **Calories** are a measure of the amount of energy the food provides. The sweetened applesauce has more calories than the unsweetened applesauce, because it contains **added sugars**, which add calories to the food. Ask students to look for sugars in the ingredient list. ***Note:*** *Added sugars are not noted on the Nutrition Facts label, but can be found in the ingredients list. "Sugars" on the Nutrition Facts label reflects a combination of both added sweeteners, such as table sugar, as well as naturally occurring sugars in the fruit or vegetable.*

Solid Fats: Students can tell the amount of solid fats in the food by looking at the grams of **saturated fat** and ***trans* fat** on the label. These are two types of solid fats. For *trans* fat, look for foods that have 0g of *trans* fat. For saturated fat, the label also provides the **percent daily value (%DV).** The %DV is a number that tells you if there is a lot or a little of something in a serving of the food. A %DV of 5% or less is low; 20% or more is high. Choose foods that are low in saturated fat.

Sodium: Have students find the %DV for sodium. Which foods are lower in sodium?

Activity II. Fruit Imposters (20 minutes, Health/Science)

1. Ask students to share foods they eat that are fruits or that they think contain fruit. Explain that not all foods with fruity names or pictures of fruit on their packaging actually contain real fruit. Some may have none or only a small amount of fruit. Such products may contain fruit flavorings that make them taste like a fruit, but they do not belong to the **Fruit Food Group**. These foods also tend to be high in added sugars. Ask students how they can spot these imposters. Allow students to share their ideas.

2. Explain that they can look at the ingredients list to see if fruit is the first ingredient. If it is, that means the product contains more fruit than any other ingredient. The food label on beverages should note what percentage of the drink is actual fruit juice. Look for products that are 100% juice.

3. Remind students that if a food has a sugar as one of the first three ingredients, it is high in added sugars. These foods provide extra calories but few nutrients. One should limit eating such foods to every now and then; not every day.

4. Distribute the handout ***Fruit Imposters*** (p. 89). Have students work in pairs to identify the fruit imposters. They will need to study the labels and ingredients list.

5. Ask students to share their findings. *Which snack has the real fruit? (Option 2) Which snack has the most added sugar? (Option 1) Which snack has the most calories per serving? (Option 1)*

Activity III. Melon Fruit Salsa (40 minutes, Health)

***Allergy Alert!** See p. 2 for more information on food safety and allergies before starting this food preparation activity.*

***Prepare:** Collect, wash, and chop ingredients for Melon Fruit Salsa recipe (see sidebar). Adapt amounts to suit class size (serves 12). Provide ingredients in separate bowls, but have a large bowl (enough to accommodate at least 3 cups) to mix the salsa in, along with a large spoon. Serve recipe to students in small plastic cups with spoons and with whole-wheat pita chips.*

1. Tell students that they will get to prepare and taste a simple recipe featuring cantaloupe *(or any other melon growing in the garden).*

2. First, have **Garden Teams** assist you in collecting melons or ripe fruit from the garden, along with any herbs, that are ready for harvest. **(p. 105)**

3. Next, have students wash their hands following proper procedures (see p. 5). Offer a few pieces of melon for students to taste and invite them to write their observations in their **Garden Journals**. Prepare the melon recipe by chopping up and deseeding the melon and other ingredients in advance and then ask for student volunteers to combine the ingredients following the recipe (see sidebar).

4. Scoop ¼ cup of the melon salsa into individual cups for each student to enjoy. Ask students to comment on the flavors of the herbs and other ingredients and how they enhance one another without the need for added salt or sugar.

REFLECT (40 minutes, English Language Arts)

1. Have students revisit the ***Fuel Up With Veggies ... and Zoom to the Finish*** (p. 76, Lesson 4) and re-track their eating habits for 2 days. Ask students to reflect in their **Garden Journals** on their journey with fruits and vegetables. Ask: *Have your habits changed? Do you eat more fruits and vegetables at meals? What were your biggest obstacles in trying new vegetables or fruit? How did you overcome them?*

2. In what other ways can students continue to inspire healthy change and plant good ideas throughout their school? What tips can they share with their friends, family, and community? Have students write their ideas then share them with the rest of the class.

GARDEN HARVEST

The best part about planting fruits and vegetables is harvesting and eating them! Have your **Garden Teams** check the fruit and vegetables growing in the garden to see if any of them are ready to harvest. **(pp. 104-105)** Use them in the melon tasting activity.

DIG DEEPER!

Study the packaging for a fruit-flavored drink or snack. Ask students to reflect and report back about any imagery or text on the package that may mislead someone to think the product contains fruit or 100% fruit juice. Remind students to look at the ingredients list and Nutrition Facts label to see what a product actually contains and how healthful it is.

Look for food advertising at school. How do your students think the ads influence food choices? How can fruits and veggies be promoted at school?

Recipe

Melon Fruit Salsa

Serves: 12 as a snack
Serving Size: ¼ cup

***Note:** Check p. 2 for Important Food Safety Steps and Allergy Reminders.*

Preparation Time: 15 minutes
Serves: 12
Serving Size: ½ cup

Supplies:
- 2 baking pans
- spatula

Ingredients:
- 2 cups honeydew, cantaloupe, or watermelon, seeded, chopped
- ½ cup cucumber, peeled, seeded, chopped
- ½ cup green bell pepper, seeded, chopped
- 2 tablespoons fresh cilantro or mint, chopped
- ¼ cup lemon or lime juice
- 1 jalapeño pepper, seeded, finely chopped (optional, as it adds spice)
- 3 cups whole-wheat pita chips (optional)

Directions:
1. In a medium-size bowl, stir together all ingredients.
2. Taste and season with lemon or lime juice.
3. Serve alone or with whole-wheat pita chips.

The Power of Choice (Page 1 of 2)

Name: _____ **Date:** _____

Fruits and vegetables are naturally low in calories, **added sugars**, and **solid fats** — which makes them healthy choices. Sometimes **sugars** and **solid fats** are added to fruit and vegetable foods during processing or preparation. This can make these foods higher in extra calories that the body does not need.

How do you know what's in a food?
Read and compare the Nutrition Facts labels and ingredients lists of the foods below to see what is in each food, as well as the calories, sodium, and solid fat content.

You have the power of choice. Can you make the healthier one?

Applesauce With Sugar

Nutrition Facts
Serving Size 1/2 cup

Amount Per Serving	
Calories 100	Calories from Fat 0
	% Daily Value*
Total Fat 0g	**0**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 15mg	**1**%
Total Carbohydrate 23g	**8**%
Dietary Fiber 1g	**4**%
Sugars 22g	
Proteins 0g	

Vitamin A 0%	•	Vitamin C 0%
Calcium 0%	•	Iron 0%

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

Ingredients: Apples, Corn Syrup, High Fructose Corn Syrup, Sugar, Water, Natural Flavor, Ascorbic Acid (Vitamin C).

Which applesauce is lower in **calories**?

_____

_____

What **sugars** are in the ingredient list for the sweetened applesauce?

_____

_____

Unsweetened Applesauce

Nutrition Facts
Serving Size 1/2 cup

Amount Per Serving	
Calories 51	Calories from Fat 0
	% **Daily Value***
Total Fat 0g	**0**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 10mg	**0**%
Total Carbohydrate 14g	**5**%
Dietary Fiber 1g	**5**%
Sugars 12g	
Proteins 0g	

Vitamin A 0%	•	Vitamin C 0%
Calcium 0%	•	Iron 0%

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

Ingredients: Apples, Water, Ascorbic Acid (Vitamin C).

The Power of Choice (Page 2 of 2)

Name: _____ Date: _____

Tomato Soup, Prepared With Water

Nutrition Facts
Serving Size 1 cup

Amount Per Serving	
Calories 75	Calories from Fat 10
	% Daily Value*
Total Fat 1g	**0**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 470mg	**20**%
Total Carbohydrate 16g	**5**%
Dietary Fiber 2g	**6**%
Sugars 10g	
Proteins 2g	

Vitamin A	10%	• Vitamin C	26%
Calcium	2%	• Iron	8%

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

What is the **%DV** (Percent Daily Value) for **sodium** for the regular tomato soup?

_____

What is the **%DV** for the reduced **sodium** soup?

_____

Reduced-Sodium Tomato Soup, Canned, Prepared With Water

Nutrition Facts
Serving Size 1 cup

Amount Per Serving	
Calories 75	Calories from Fat 10
	% Daily Value*
Total Fat 1g	**0**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 80mg	**3**%
Total Carbohydrate 16g	**5**%
Dietary Fiber 2g	**6**%
Sugars 10g	
Proteins 2g	

Vitamin A	10%	• Vitamin C	26%
Calcium	2%	• Iron	8%

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

Frozen Broccoli

Nutrition Facts
Serving Size 1/2 cup

Amount Per Serving	
Calories 25	Calories from Fat 0
	% Daily Value*
Total Fat 0g	**0**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 10mg	**0**%
Total Carbohydrate 5g	**2**%
Dietary Fiber 3g	**12**%
Sugars 1g	
Proteins 3g	

Vitamin A	20%	• Vitamin C	60%
Calcium	4%	• Iron	4%

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

What is the **%DV** for **saturated fat** for each?

_____

What is the **%DV** for **sodium**?

_____

Which has more **calories**?

_____

Frozen Broccoli With Cheese Sauce

Nutrition Facts
Serving Size 1/2 cup

Amount Per Serving	
Calories 105	Calories from Fat 60
	% Daily Value*
Total Fat 7g	**11**%
Saturated Fat 3g	**15**%
Trans Fat 0g	
Cholesterol 14mg	**5**%
Sodium 178mg	**7**%
Total Carbohydrate 7g	**3**%
Dietary Fiber 2g	**8**%
Sugars 3g	
Proteins 6g	

Vitamin A	14%	• Vitamin C	52%
Calcium	15%	• Iron	6%

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

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Fruit Imposters

Name: _____ **Date:** _____

Did you know that not all foods with fruity names or pictures of fruit on their packaging actually contain real fruit? Some may have only a small amount of fruit. Such products may have only fruit flavorings that make them taste like a fruit. Not only do they not belong to the **Fruit Food Group**, but they also tend to be high in added sugars. Study the labels and ingredients list below.

Can you spot the fruit imposters?

Fruit Punch

Nutrition Facts
Serving Size 1 drink box (200ml)
Servings Per Package 10

Amount Per Serving	
Calories 90	Calories from Fat 0
	% Daily Value*
Total Fat 0g	**0**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 15mg	**1**%
Total Carbohydrate 25g	**8**%
Dietary Fiber 0g	**0**%
Sugars 25g	
Proteins 0g	

Vitamin A 0% • Vitamin C 100%
Calcium 0% • Iron 0%

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

Ingredients: Pure Filtered Water, Sweeteners (High Fructose Corn Syrup), Orange and Pineapple Juices from Concentrate, less than 0.5% of: Vitamin C (Ascorbic Acid), Citric Acid (Provides Tartness), Natural and Artificial Flavors.

Imposter? YES / NO

Fruit Snacks

Nutrition Facts
Serving Size 1 pouch (26g)
Servings Per Package 6

Amount Per Serving	
Calories 100	Calories from Fat 10
	% Daily Value*
Total Fat 1g	**2**%
Saturated Fat 0.5g	**3**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 30mg	**1**%
Total Carbohydrate 22g	**7**%
Dietary Fiber 0g	**0**%
Sugars 13g	
Proteins 0g	

Vitamin A 0% • Vitamin C 100%
Calcium 0% • Iron 0%

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

Ingredients: Corn Syrup, Sugar, Fruit Juice Concentrate (Apple, Grape, Strawberry, Orange, Lemon), Modified Corn Starch, Partially Hydrogenated Vegetable Oil (Cottonseed and Soybean), Malic Acid, Ascorbic Acid (Vitamin C), Natural and Artificial Flavors, Mineral Oil, Blue 1, Red 40, Yellow 5, Yellow 6, Carnauba Wax.

Imposter? YES / NO

Pineapple Chunks

Nutrition Facts
Serving Size 0.5 cup (120ml)
Servings Per Container 4

Amount Per Serving	
Calories 80	Calories from Fat 0
	% **Daily Value***
Total Fat 0g	**0**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 0mg	**0**%
Total Carbohydrate 19g	**6**%
Dietary Fiber 1g	**4**%
Sugars 15g	
Proteins 0g	

Vitamin A 0% • Vitamin C 15%
Calcium 0% • Iron 0%

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

Ingredients: Pineapple, Pineapple Juice, Preservatives.

Imposter? YES / NO

Lesson 10: Harvest Celebration

TOTAL TIME REQUIRED: 145 minutes / 3 sessions
Session 1: Getting Started 15 min;
Activity I "Reflecting on Our Journey" 30 min (English Language Arts)
Session 2: Activity II "What We Learned" 40 min (English Language Arts/Health/Science/Math*)
Session 3: Harvest Celebration 60 min**

***Standards met will depend on project. See p. 11.**
****Time will vary. See suggested activities on p. 62.**

Key Message:

Try more and eat new fruits and vegetables. Explore the world of possibilities in the garden and on your plate!

Subject Connections:

English Language Arts, Health, Science, Math

Learning Objectives:

Students will be able to…

- Creatively share what they've learned about gardening, nutrition, and fruits and vegetables using a variety of media (written and oral).
- Promote the benefits of eating more fruits and vegetables to a diverse audience.

Supplies:

- Harvest and clean vegetables and fruits ahead of celebration. See p. 66 for event ideas, preparation requirements, and schedule suggestions.
- Letter paper (or card stock), poster board
- Art supplies (colored pencils, markers, scissors, glue, paint, etc.)
- Computers with word-processing and slide-show presentation software, projector
- **Garden Journals**
- Student handouts (p. 90):
  1. ***My Garden Fresh Moments***

Featured Fruits and Vegetables:

Any fruits and vegetables from the garden

LESSON OVERVIEW:

In this final lesson of ***Dig In!***, students will celebrate all that they have learned about fruits and vegetables and accomplished. They will reflect on their educational journey and create presentations to share with the rest of the school and local community. Everyone will get to enjoy the taste of a fresh harvest while eating and sharing their favorite fruit and vegetable dishes.

ESSENTIAL QUESTIONS: *What have I learned about fruits and vegetables? What have I learned in the garden? What have I learned about my own health? What was my growing moment?*

TEACHING PROCEDURE:

Planning the Harvest Celebration

It's time to share and celebrate everything that you and your students have learned, discovered, and created throughout the last nine lessons! Your **Harvest Celebration** can be customized to suit your school, schedule, and community. You can have an all-day celebration, plan events throughout the week, or simply celebrate during a class period. Invite parents, the local community, media, and other classes to visit. Remember, it's all about sharing your knowledge, having fun, and celebrating your garden harvests and student accomplishments!

Below is a suggested schedule to help you plan the celebration:

2-3 months before

- Pick a date for your Harvest Celebration and add it to the school calendar and newsletter.
- Write and send invitations to parents, community members, local agricultural vendors, and media to join in the Harvest Celebration.
- Ask for parent volunteers to help organize.
- Invite guest speakers (gardeners, farmers, chefs).

1 month before

- Put together a cookbook featuring favorite fruit and vegetable recipes created by the students, and print copies.

2 weeks before

- Write and submit a press release to the local media summarizing your garden activities and announcing the celebration and purpose.

1 week before

- Send reminders to parents and community members about the celebration.
- Enlist parent and community volunteers to help prepare the garden, fruit and vegetable dishes, presentation space, etc.
- Print and make copies of information for visitors to take home.

1 day before

- Harvest fruits and vegetables from the garden. **(pp. 104-105)**
- Prepare dishes for the celebration. (If possible, wait until day of celebration to keep produce fresh!)
- Set up sharing stations, put up signs, and finish displays and bulletin boards.

LEARNING ACTIVITIES

Activity I. Reflecting on Our Journey (30 minutes, English Language Arts)

1. Distribute the handout ***My Garden Fresh Moments*** (p. 90). Have students reflect on their journey of learning about fruits and vegetables, nutrition, and gardening. Give them time to go through their **Garden Journals** and reread through their notes and reflections.

2. Ask: *What was your favorite moment? What was your most memorable activity? What is the most important thing you have learned about gardening, your own health, fruits, and vegetables? What was your favorite new fruit or vegetable? What are you the most proud of?*

3. Next, tell students they will take their personal reflections and turn them into a written piece to share. They will choose a "***Garden Fresh Moment***" in which they feel they learned the most, and write a poem, essay, song, short story, or article for the newsletter or the local newspaper.

4. Have students first work individually on their drafts, then in pairs to peer-edit their writing reflections. If they have time, they can create colorful illustrations of their favorite moments on the ***My Garden Fresh Moments*** handout.

Activity II. "What We Learned" Presentations (40 minutes, English Language Arts/Health/Science)

1. Divide the class into groups of three to four students. Explain that students will work together to create a five-minute oral presentation to share with the rest of the school and visitors during the **Harvest Celebration**. Students in each group should choose a different topic from the list below (or select their own topic from the areas the class studied):
   - **The Food Supply System**
   - **Nutrients in Fruits and Vegetables**
   - **How to Make Healthy Food Choices**

2. First, have students in each group list everything they have learned under their topic. Next, have them organize the information to identify the most important parts of that lesson. Students in each group must summarize what they have learned regarding their topic and *how* they reached their discoveries, and communicate clearly *why* it is important to know and understand this information. They can use computers and slide-show software to create their presentation. Encourage them to use photos and video to share information. Students may also create skits, songs, or prepare cooking demonstrations.

3. Give groups opportunities to rehearse, plan, and revise their presentations at least twice before the **Harvest Celebration**. Have students practice in front of the class and ask for suggestions on how to improve their presentations.

ARTFUL DISPLAYS

Work with the art teacher to create colorful displays of your students' work and gardening experiences. Collect images of students working in the garden and have students prepare a bulletin board that includes images and writings.

LESSON 10 HANDOUT 1

My Garden Fresh Moments

Name: _____ **Date:** _____

Throughout this unit, you've learned about and tasted a variety of fruits and vegetables, worked in the garden, and gained lifelong skills to help you take care of your health.

Reflection:

1) What was my most memorable activity?
2) What have I learned about fruits and vegetables? What new fruits and vegetables did I discover and try? What are my favorites?
3) What have I learned about gardens?
4) What have I learned about my own health?
5) What is the most interesting or exciting thing I have learned that I think will help me in my life?

My Garden Fresh Moment:

Use the reflection questions above to help you with your creative writing. You may choose to write a short story, a poem, a song, an essay, or an article for your local newspaper. What memory do you want to share?

Illustrate Your Moment:

Draw a picture or make a collage of your "Garden Moment." Write about it in your Garden Journal.

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