

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 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)

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 $\frac{3}{4}$ 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

- 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.
- 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)

- 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.
- 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).
- 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?



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.

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?*

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
- colander
- large spoon
- 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!

