

Chapter 3

Vegetables

Vegetables are the parts of plants that people eat including roots, tubers, bulbs, stems, leaves, fruits, flowers, seeds and sprouts. Most Americans do not eat the variety or amount of vegetables that they need for healthy living. For this reason, it is important to learn about the nutrition and science of cooking vegetables.

Enjoy taking a trip to vegetable paradise!

Hands-On Lessons:

Vegetable Jungle	20
Stating the Facts About Vegetables	21
Vegetable Rainbow	22
Color Changes in Acids and Bases	23
Eating Vegetables	24
Scientific Soup	25

Answer Keys:

Vegetable Jungle	26
Vegetable Rainbow	26
Eating Vegetables	27
Proficiency Questions	27

Virtual Lessons:

(See *Virtual FoodMASTER CD*)

Vegetable Jungle
Classification of Vegetables
Vegetable Rainbow
Chemical Changes
Leaching Vegetables
Leaching Nutrients
Vegetable Variety
Getting Variety in Your Diet

Vegetable Jungle

Summary

Students will measure the weight and length or circumference of various vegetables. After studying the vegetables, students will classify the vegetables based on plant parts.

Objectives

1. Students will select appropriate measurement tools for measuring weight, length and circumference.
2. Students will practice measurement skills using appropriate units for weight, length and circumference.
3. Students will classify vegetables into five groups.

Academic Content Standards

MATHEMATICS COMMON CORE

Grade 3

- 3.NF.1 Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size $1/b$

NEXT GENERATION

SCIENCE STANDARDS

Grade 4

- 4-LS1.A Plants and animals both have internal and external structures that serve various functions in growth, survival, behavior, and reproduction

SCIENTIFIC INQUIRY:

Stating the Facts About Vegetables

Materials

For the teacher: 1 paring knife.

For each group: 1 food scale, 1 broccoli piece, 1 celery stalk, 1 lettuce leaf, 1 green pepper, 1 potato.

For each student: 1 hand lens, 1 measuring tape (or use string and a ruler).

Procedure

1. Read *Vegetable Jungle* and complete the Doodle Bugs.
2. Pass out vegetables, giving each group a broccoli piece, celery stalk, lettuce leaf, green pepper and potato. Alternatively, you may set up stations for each vegetable and have students rotate as a group from one station to the next.
3. Students will measure the vegetables' weights using the scale and lengths or circumferences using the measuring tape. Remind students to include units (centimeters or inch and grams or ounces) when recording measurements in the *Vegetable Facts* table.
4. After measurements are complete, cut the vegetables in half.
5. Instruct students to use their hand lenses to study the inside and outside of each vegetable and record the color, size and shape under "appearance" in the table.
6. Discuss the classification of each vegetable. **"What group does the vegetable belong in? Does this vegetable grow below or above ground? Does it contain seeds? How did you know it belonged in the root, stem, leaf, flower, or fruit group?"**
7. Instruct students to complete the *Vegetable Facts* table.

Teacher Tips:

- Review the term circumference at the beginning of the lesson.
- Review units of measurement and use of scales and measuring tapes.
- In place of tape measures, students may mark their vegetable's circumference on a piece of string and then measure the length of the string using a ruler.
- Only the teacher should use the pairing knife to cut the broccoli.
- You can save extra broccoli for *Vegetable Rainbow: Chemical Changes*. To reduce food costs, substitute carrots and red cabbage for the potatoes and lettuce. Then save the extra carrots and red cabbage for *Vegetable Rainbow: Chemical Changes*.
- Rinse, cut and serve any other extra vegetables to students. Ask students **"How do the vegetables taste — sweet, sour or bland? How do the vegetables feel in your mouth — mushy, crunchy, smooth or stringy?"**
- Students may wonder if tomatoes are a fruit or a vegetable. Nutritionally they are vegetables! However, they are vegetables that are the fruit of the plant. Can your students think of any other vegetables that are the fruit of the plant? (Cucumbers, green peppers, pumpkins, squash)

Vegetable Rainbow

Summary

The class will learn about chemical reactions by cooking different colored vegetables in acidic and basic water.

Objectives

1. Students will be able to state an example of a chemical reaction, an acid and a base.
2. Students will observe chemical reactions and record color changes.

Academic Content Standards

MATHEMATICS

Measurement Standard

Apply appropriate techniques, tools, and formulas to determine measurements.

Expectation:

- Select and apply appropriate standard units and tools to measure length, area, volume, weight, time, temperature, and the size of angles.

Data Analysis and Probability Standard

Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

Expectation:

- Collect data using observations, surveys, and experiments.
- Represent data using tables and graphs such as line plots, bar graphs, and line graphs.

SCIENCE

Science as Inquiry: Content Standard A

Develop abilities necessary to do scientific inquiry.

Expectation:

- Plan and conduct a simple investigation.
- Use data to construct reasonable explanations.

Physical Science: Content Standard B

Properties of objects and materials.

Expectation:

- Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools, such as rulers, balances, and thermometers.

SCIENTIFIC INQUIRY:

Color Changes in Acids and Bases

Materials

For the teacher: Double burner hot plate, 2 pots (A and B), liquid measuring cup, tablespoon, 2 slotted spoons, 3 strong plates (Labeled A, B and C), 8 cups of water, 3 tablespoons of vinegar, 3 tablespoons of baking soda, 3 raw broccoli pieces, 3 raw carrot pieces, 3 red cabbage leaves, 3 small chunks of white onion.

Procedure

1. Place two pots on a double burner. Have students measure and pour 4 cups of water into each pot. Bring the water to a boil.
2. Read *Vegetable Rainbow* and complete the Doodle Bugs while the water heats.
3. Have students carefully measure and add three tablespoons of vinegar (acid) to pot A and three tablespoons of baking soda (base) to pot B.
4. Use the slotted spoons to stir the water in each pot.
5. Use the slotted spoon to gently add a piece of each kind of vegetable to pot A and to pot B. Place remaining raw vegetables on plate C (C=raw).
6. After the color changing reaction occurs, remove the vegetables from the water and place on corresponding plates (plate A = acid, plate B = base). Allow students to observe the color changes.
7. Compare the raw pieces to the cooked pieces. **“What colors are the raw vegetables, the vegetables cooked in an acid, the vegetables cooked in a base? Which vegetable changed colors the most, the least? Did the vegetables change colors more or less in the acidic water or basic water? Did the color changing reactions happen slowly or quickly? Would you want to eat broccoli cooked in the acidic water? Why or why not?”**
8. Instruct students to complete the *Color Facts* table and final question.

Teacher Tips:

- Be very careful when using the hot plates. Discuss the dangers of touching the hot plate, hot pans and hot water before beginning the lesson.
- If available, use clear pots to allow students to observe the color changes as they occur.
- The color changes will occur very soon after the vegetables are added.
- For enhanced individual up-close observation with each vegetable, add several pieces of each vegetable to the two pots. Then provide samples of raw, cooked in acid and cooked in base vegetables to small groups of students.
- Real life application:
 1. Sometimes cooks add apples when cooking cabbage. The apples are acidic and turn the cabbage into a beautiful red color.
 2. To prevent cooked vegetables from becoming mushy, avoid adding bases like baking soda while cooking.

Eating Vegetables

Summary

The class will use a variety of vegetables to prepare soup.

Objectives

1. Students will be able to name at least one vitamin found in vegetables.
2. Students will select and use appropriate kitchen measurement tools.
3. Students will evaluate their soup creation.
4. Students will design or plan a new soup.

Academic Content Standards

MATHEMATICS

Measurement Standard

Apply appropriate techniques, tools, and formulas to determine measurements.

Expectation:

- Understand the need for measuring with standard units and become familiar with standard units in the customary and metric systems.
- Select and apply appropriate standard units and tools to measure length, area, volume, weight, time, temperature, and the size of angles.

SCIENCE

Science and Technology:

Content Standard E

Abilities of technological design.

Expectation:

- Propose a solution.
- Implement a proposed solution.
- Evaluate a product or design.
- Communicate a problem, design, and solution.

Science in Personal and Social Perspectives:

Content Standard F

Personal health.

Expectation:

- Nutrition is essential to health. Students should understand how the body uses food and how various foods contribute to health. Recommendations for good nutrition include eating a variety of foods, eating less sugar, and eating less fat.

SCIENTIFIC INQUIRY:

Scientific Soup

Materials

For the teacher: Single or double burner hot plate, large pot, large stirring spoon, 1 set measuring spoons, can opener, 6 cups tomato juice, 1 teaspoon pepper, 1 teaspoon oregano, 16-ounce can diced new potatoes, 16-ounce can carrots, 16-ounce can corn, 16-ounce can green beans. *Note: Instead of using canned vegetables, you could use frozen diced potatoes, frozen carrots, frozen corn and frozen green beans.* Optional: Basil, garlic, parsley, onion flakes, red pepper, brown sugar.

For each student: 1 spoon, 1 cup or bowl (foam or other heat stable product).

Procedure

1. Begin by placing your large pot on the hot plate burner. Add the tomato juice. Bring to a boil and then reduce heat so the broth simmers (little bubbles).
2. Read *Eating Vegetables* and complete the Doodle Bugs.
3. Next, have students carefully measure and add one teaspoon of pepper and one teaspoon of oregano.
4. Allow students to help add the potatoes, carrots, corn and green beans.
5. Student helpers may take turns stirring the soup.
6. Direct your students to smell the soup and decide as a class if they want to add additional spices.
7. With your guidance, students can decide how much of each spice to add. Allow students to measure and carefully add the extra spices.
8. Let the soup simmer for five minutes.
9. While the soup is simmering, discuss the variety of vegetables used (colors and types). In addition, you can explain the three components of soup: liquid (broth or juice), seasoning/spices and chunks of vegetables, meat, noodles, rice, etc.
10. Students may then begin brainstorming their own personal soup creation.
11. Serve soup in cups or bowl (not paper). Then let students try the soup.
12. Instruct students to rate their soup using the smiley face scale.
13. Next, students will create their own kind of soup and record the steps under *My Soup Creation*. Ask probing questions to help students with their soup creations. **“What did you like best about our soup? What did you not like? What did we do or add first? What liquid would you use, tomato juice, chicken broth, beef broth? What did we add next? Would you make your soup spicier by adding chili powder & red pepper? Would you add any vegetables, meat, noodles, rice, beans?”**

Teacher Tips:

- Be very careful when using the hot plates. Discuss the dangers of touching the hot plate, hot pans and hot water before beginning the lesson.
- The teacher, not students, should use a can opener to open cans. Consider opening cans prior to starting the activity; be sure to dispose of sharp lids and cans properly.
- If preferred, you could use a crock-pot for this activity.
- Extension: Read *Stone Soup* and asking each student to bring in one small can of vegetables for this activity.

Answer Keys

Vegetable Jungle

Doodle Bugs

- Circle: Carrots, turnips or potatoes
Box: Asparagus or celery
Fill-in the blank: Kale, spinach, romaine lettuce, mustard greens, turnip greens, mint, collard greens, etc.
Fill-in the blank: It is the fruit of the plant because it contains the plant's seeds.

SCIENTIFIC INQUIRY:

Stating the Facts About Vegetables

- Broccoli: 25 grams (0.9 oz); 2.5 inches (6.4cm); dark green, looks like a tree; flower
Celery: 40 grams (1.4 oz); 3 inches (7.7cm); light green, gets wider and whiter at the bottom; stem
Lettuce leaf: 12 grams (0.4 oz); 4 inches (10.2 cm); light green, flat with veins running through it; leaf
Green pepper: 165 grams (5.8 oz); 10 inches (25.5 cm); bright green with white seeds inside, spherical shaped with a stem on top; fruit
Potato: 213 grams (7.5 oz); 8 inches (20.5 cm); brown outside but white inside, oblong; root

Vegetable Rainbow

Doodle Bugs

- Circle: Lemon juice, vinegar, cream of tartar
Fill-in the blank: Lime juice, grapefruit juice, cranberry juice
Fill-in the blank: It is a nice bright green, but it is very mushy.

SCIENTIFIC INQUIRY:

Color Changes in Acids and Bases

- Broccoli: Green; dull green or brownish green (acid); bright green (base)
Carrot: Orange; slightly lighter orange (acid); orange (base)
Red cabbage: Deep red; bright red (acid); blue (base)
White onion: White, clear white (acid); yellow (base)

Which vegetable's color is changed the least by the acid and base?

The carrot's color is the least changed by the acid and base. It is a slightly lighter orange when cooked in the acidic water and it does not change color when cooked in the basic water.

Answer Keys (continued)

Eating Vegetables

Doodle Bugs

- Box: **2-2 1/2 cups**
 Fill-in the blank: **Mashed potatoes, mashed sweet potatoes, mashed cauliflower, etc.**
 Underline: **Vitamin C helps heal cuts and scrapes.**
 Fill-in the blank: **Orange vegetables are full of vitamin A and help with eyesight.**

SCIENTIFIC INQUIRY:

Scientific Soup

How many different colored vegetables are in your soup? Is this a good variety?

There are four different colored vegetables in my soup, plus red tomato juice. The four vegetables are white potatoes, orange carrots, yellow corn and green beans. I think this is a good variety.

Like/Dislike: **Answers will vary.**

My soup creation: **Answers will vary.**

- Example:** 1. Place the pot on the stove.
 2. Add chicken broth.
 3. Add garlic powder, parsley and ground pepper.
 4. Add chicken chunks, noodles, carrots, celery and onions.

Proficiency Questions (Workbook)

1. **b** 2. **a** 3. **b** 4. **c** 5. **a** 6. **d**

Proficiency Questions (Virtual CD)

1. **b** 2. **a** 3. **b** 4. **c** 5. **a** 6. **b** 7. **d** 8. **a**