

The Nutrient Database

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

Grade Levels: 6th-12th Grade

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

Objectives: Students will:

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

Life Skills: Analyzing, comparing, evaluating, researching

Materials Needed:

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

Time:

Introduction: 20 minutes plus time to define vocabulary

Activity One: 45 minutes to one hour

Activity Two: 45 minutes to one hour

Activity Three: 45 minutes to one hour

Preparation:

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

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

Background Information:

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

Florida Standards Met At-A-Glance

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

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

Introduction:

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

Activity One:

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

Activity Two:

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

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

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

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

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

Activity Three:

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

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

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

Evaluation Options:

1. Assess student performance in completing the assigned research and cooperation in completing the group work, including accuracy, completeness, discussion, developing rubric and comparing produce.
2. Have students use their nutritional requirements (found in the introduction) and the USDA “Nutrient Database” to create a week-long menu of healthy meals that will meet their nutritional requirements using the produce from the garden.

3. Have students create a vehicle to promote eating fruits and vegetables to their peers with sound explanations that will result in changing behaviors with a focus on promoting fruits and vegetables grown in the school garden.

Extensions or Variations:

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

Resources:

USDA “Nutrient Database,” U.S. Department of Agriculture. www.ndb.nal.usda.gov

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

Credits:

Bermudez Consultenos International. “Updated Analysis of the 1994-96, 1998, Continuing Survey of Food Intake by Individuals (CSFII)” August 2002.

Cotton PA, et.al. “Dietary Sources of Nutrients Among US Adults,” *Journal of the American Dietetic Association*, 2004 June 1, 04 (6):921-30.

USDA “Nutrient Database,” U.S. Department of Agriculture. www.ndb.nal.usda.gov

“Nutrient Data Laboratory,” United States Department of Agriculture. www.ars.usda.gov

The Nutrient Database

Sample Pre-Post Assessment

1. List one credible source of information on nutrition that is research based.
2. What government agency conducts research on the nutritional composition of foods?
3. List three foods from the school garden and a specific nutrient that each supplies.
4. Give one reason why eating fruits and vegetables is important to your health.

Nutrients from the Garden

STUDENT HANDOUT

Name _____

Select three fruits or vegetables grown in the school garden that you believe contain the highest level of nutrients. Using the U.S. Department of Agriculture's "Nutrient Database" at www.ndb.nal.usda.gov complete the information requested below. NOTE: Common use of the terms fruit and vegetable are used and not botanical designations.

Fruit or Vegetable	Serving Size	Carbohydrate		Protein	Fiber	Fat					
		Total	Sugar								
Minerals:	Calcium	Iron	Magnesium	Phosphorus	Potassium	Sodium	Zinc				
Fat-soluble Vitamins:	A (RAE)	A	D	D 2 & 3	E	K					
Water-soluble Vitamins:	C	Thiamin	Riboflavin	Niacin	B-6	Folate					
		B-12									
Lipids	Saturated Fatty Acids	Monounsaturated Fatty Acids	Polyunsaturated Fatty Acids	Cholesterol							

Nutrients from the Garden

Name _____ *SAMPLE* _____

Select three fruits or vegetables grown in the school garden that you believe contain the highest level of nutrients. Using the U.S. Department of Agriculture's "Nutrient Database" at www.ndb.nal.usda.gov complete the information requested below. NOTE: Common use of the terms fruit and vegetable are used and not botanical designations.

Fruit or Vegetable	Serving Size	Carbohydrate		Protein	Fiber	Fat	
		Total	Sugar				
Carrot—raw	1 cup chopped	12.26 g	6.07g	1.19 g	3.6 g	0.31g	
		Minerals:	Iron	Magnesium	Phosphorus	Potassium	Sodium
	42mg	0.38mg	15mg	45mg	410mg	88mg	0.31mg
Fat-soluble Vitamins:	1069mcg	A (RAE)	A	D	D 2 & 3	E	K
		21384 IU	0.0 IU	0.0µg	0.84mg	16.9µg	
Water-soluble Vitamins:	7.6mg	C	Thiamin	Riboflavin	Niacin	B-6	Folate
		0.084mg	0.074mg	1.258mg	0.177mg	24mcg	
		B-12					
	0.0µg						
Lipids	Saturated Fatty Acids	Monounsaturated Fatty Acids		Polysaturated Fatty Acids		Cholesterol	
		0.047g	0.018g	0.150g	0.0mg		