



As a community, we must educate our young people about healthy lifestyles in order to raise generations of children free from the burden of obesity.

## Integrating Concepts about Food, Nutrition and Physical Activity into Middle School Curriculum

Creatively Meeting Core Standards for Math, Science, Language Arts and Social Studies

Community Voices for Health  
SCHOOL OF EDUCATION, TEACHING & HEALTH  
AMERICAN UNIVERSITY

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# Table of Contents

Introduction .....	1
Before You Start .....	2
Carbohydrates: Integrating Nutrition Into Core Subjects.....	4
Carbohydrates: Lessons .....	6
Protein: Integrating Nutrition Into Core Subjects.....	9
Protein: Lessons .....	11
Lipids: Integrating Nutrition Into Core Subjects .....	15
Lipids: Lessons.....	17
Minerals: Integrating Nutrition Into Core Subjects .....	21
Minerals: Lessons.....	23
Vitamins: Integrating Nutrition Into Core Subjects .....	27
Vitamins: Lessons.....	29
Water: Intregrating Nutrition Into Core Subjects.....	33
Water: Lessons.....	35
Lesson Record Form.....	39
Tracking Your Efforts.....	40
School Gardens .....	41

# Introduction

Teachers are already burdened with expectations beyond teaching their core curriculum, but the truth is that teachers are best positioned to impact students in a holistic way. Working with middle school students, especially in economically disadvantaged neighborhoods, nutrition and health can take a back seat to school achievement, but we can't escape the need to eat and the importance of good nutrition on a student's ability to concentrate and learn.

The Community Voices for Health curriculum "Integrating Concepts about Food, Nutrition and Physical Activity into Middle School" is intended to help you increase the amount of nutrition education and physical activity you are providing for your students. Educators agree that healthier students are better learners (Basch, C.), so empowering students to make healthy food choices and be physically active is very important to academic achievement. Healthy environments, good role-models, and learning opportunities all contribute to improving the health behaviors and academic outcomes of your students.

The following conceptual model will stimulate teachers' interest in topics about food, food production, gardening and nutrition, and help them seamlessly include them in their regular lesson plans. The curriculum is organized into six nutrient content areas - carbohydrates, protein, fat, vitamins, minerals and water. Each content area contains fundamental food, growing, nutrient and food labeling information, common core standards for math, language arts, science and history, provocative facts and questions, and lesson suggestions. The intent of the design is that teachers can easily coordinate with their colleagues across their grade, and the school, to focus the delivery to suit your school schedule and priorities.

## ***Program Goal:***

Schools will creatively incorporate food, nutrition and physical activity learning opportunities within classroom lessons and programs in order to teach information about nutrition, health and food systems, convey the value of healthy lifestyles and ultimately support the staff and students in developing healthy behaviors.

## ***Program Objectives:***

- School administrators will support a school wide emphasis on health by supporting teachers to integrate concepts about nutrition themes throughout their lessons.
- Teachers will adapt the nutrition theme to fit their current curriculum and learning standards.
- Teachers will focus on information delivery with an emphasis on practical application.
- Students will achieve a higher level of knowledge of nutrition, food and healthy behaviors.
- Students will be more empowered to make choices that promote health.

# Before You Start

## Engage Your School

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- Working with your fellow teachers and administrators, commit to school wellness measures that impact the students, staff and teachers.
- Schedule a day or week each month to focus on nutrition and physical activity school wide.
- Start a school community garden for exercise and to learn how food grows.
- Be creative in how you provide learning opportunities to the school community.

## Learn About Nutrition, Food and Physical Activity

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- Become a healthy role model to your students and peers by practicing healthier behaviors and making healthier choices.
- Discover how much better you feel when you eat well, get more physical activity and take care of your general health.
- Engage your colleagues in fun activities that support and encourage health and physical activity.

## Coordinate and Implement Across Grades and Subjects

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- Provide a copy of the Community Voices for Health curriculum to every teacher so they can decide how best to incorporate the ideas into their lessons.
- Discuss coordinating your approach in planning sessions by grade and by subject area. Lessons may vary throughout the school, but will overlap on the nutrient theme.
- Lessons can be simple or complex. For example, a math teacher can use the “Nutrition Facts” labels on food packaging to calculate percentages, or take this a step further and compare quantities of nutrients to total daily nutrient needs, and graph them on a bar chart. Use the “Did you know...” stimuli to warm up in language arts or to write a research paper/presentation.
- After each nutrient informational text sheet there is a lesson on food labels. As a supplement, look at the Chipotle website where you can demonstrate adding and subtracting ingredients and seeing real time changes in nutrient content. For example, add sour cream to your burrito and exchange chicken for beef and see the effect on fat content.
- In addition to the nutrition integration piece, teachers are asked to incorporate physical activity breaks throughout the day, and suggestions follow in this document.
- Use the “Lesson Tracking” form to record what was taught. Your school can put together a binder of ideas teachers generate to share with colleagues.  
Use the “Tracking Your Efforts” form to record when and how often you integrate nutrition and physical activity during the week. Tally the numbers for a school wide assessment of health instruction time.
- Keep in mind that food, physical activity and learning about nutrition can be really fun!

## ***Abbreviations Used in Lesson Ideas***

CDC – Center for Disease Control

DOE – Department of Energy

EPA – Environmental Protection Agency

FDA – The Food and Drug Administration

TN – Team Nutrition, USDA

USDA – United States Department of Agriculture

USGS – United States Geologic Survey

## ***Primary Resources***

Community Voices for Health

[www.american.edu/cas/seth/cvhealth/](http://www.american.edu/cas/seth/cvhealth/)

Team Nutrition, USDA

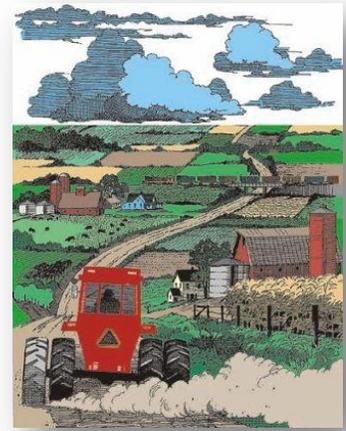
<http://teamnutrition.usda.gov/>

Food Information and Nutrition Center

<http://fnic.nal.usda.gov/>

Nutrition.gov

[www.nutrition.gov/](http://www.nutrition.gov/)



# Carbohydrates

### At a Glance

#### Recommended Dietary Intake:

130g for adults = 520 calories;  
% of Daily Calories: 50-70%

#### Calories per Gram: 4

For example, a 12 oz soda has 39 grams which equals 156 calories or 9 teaspoons sugar

#### Types of Carbohydrates:

- Sugars – Simple and Complex
- Starches
- Fiber – Soluble and Insoluble
- Glucose (form in body for energy)
- Glycogen (for storage in body)

**Function:** Body converts carbohydrates into glucose to supply energy for muscles during aerobic and anaerobic activity and for use by the central nervous system and brain. Converted into glycogen for stored energy.

**Food Sources:** fruit, vegetables, grains, wheat, potatoes, milk, nuts, beans/legumes, candy, sweets, soda, jelly, honey.

**Typical Serving Size:**  $\frac{3}{4}$  cup breakfast cereal, 38 g=152 calories.

#### Health Concerns:

Overconsumption of simple carbohydrates can contribute to chronic diseases, such as diabetes and obesity.

### Carbohydrates in the Body and Food

Carbohydrates are the main source of energy and are found in plant foods, in both simple and complex forms. Healthy sources of carbohydrates in the diet come from whole grain products like whole wheat bread, brown rice, quinoa, millet, and oats.

Vegetables, beans and legumes also contain nutrient rich, complex carbohydrates. These molecules take longer for the body to metabolize because of their high fiber content, which produces a steady release of energy as the food is being digested.

Simple sugars are abundant in fruit and milk. However, fruit also contains fiber, which helps regulate the release of energy from these sugars. Fruit juice and soda in particular, contain all of the simple sugar of fruit, with none of the fiber, leading to a spike in blood sugar, followed by a crash. Additionally, soda contains none of the health promoting vitamins and minerals that fruit contains.



### Carbohydrates in the Right Balance

While carbohydrates often get a bad rap in popular diets, complex carbohydrates, such as whole grains, are essential and healthful foods. Yet blaming carbs for the poor health of the American diet isn't entirely a myth. In fact, eating too many foods with simple carbohydrates can lead to a dramatic increase in calorie intake while providing little nutrition to the individual.

Simple carbohydrates that should be limited are often found in the form of sugars such as corn syrup, maple syrup and cane sugar. There is unexpected sugar in processed foods such as tomato sauce, yogurt, crackers and bread. Soft drink consumption can contribute a lot of added sugar to the diet as well.

Many processed foods are made with refined grain products, like white flour. When a grain is changed from its whole form to a refined form (i.e. whole wheat flour to white flour, or brown rice to white rice) the fiber and many of the vitamins and minerals are removed leaving the calories, but few of the nutrients. Avoiding these forms of carbohydrates is important to a healthy diet. Use the Nutrition Facts Label to identify good sources of carbohydrate low in simple sugars and high in fiber.

# Integrating Nutrition into Core Subjects

## Carbohydrates

### Selecting Healthy Food Using Food Labels

**Goal:** Learn how to use the Nutrition Facts Label to select foods that are good sources of carbohydrates.

**Exercise:** The Food and Drug Administration requires a nutrition facts panel on all packaged food products. This exercise demonstrates how to read and interpret the label in order to compare different foods. Have the students compare the two nutrition fact labels below to determine the healthiest source of carbohydrates. Notice that the caloric content of the food is similar, as is the amount of Total Carbohydrates. However, notice that the carbohydrates in the soda come almost entirely from sugar, while in the brown rice they are mostly complex starches. The brown rice also has fiber and protein, and the soda has none. Next, look at the ingredients list which lists food in order of ingredient by weight. When sugar (corn syrup, honey, cane sugar) is within the top five ingredients the food is considered high in sugar.

#### Brown Rice

Nutrition Facts			
Serving Size 1 cup 195g (195 g)			
Amount Per Serving			
<b>Calories</b> 216		Calories from Fat 15	
% Daily Value*			
<b>Total Fat</b> 2g			3%
Saturated Fat 0g			2%
Trans Fat			
<b>Cholesterol</b> 0mg			0%
<b>Sodium</b> 10mg			0%
<b>Total Carbohydrate</b> 45g			15%
Dietary Fiber 4g			14%
Sugars 1g			
<b>Protein</b> 5g			
Vitamin A	0%	Vitamin C	0%
Calcium	2%	Iron	5%
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:			
	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g
Calories per gram: Fat 9 • Carbohydrate 4 • Protein 4			
<b>Ingredients: Brown Rice</b>			

#### Soda

Nutrition Facts			
Serving Size 1 bottle 16 fl oz 491g (491 g)			
Amount Per Serving			
<b>Calories</b> 182		Calories from Fat 1	
% Daily Value*			
<b>Total Fat</b> 0g			0%
Saturated Fat 0g			0%
Trans Fat 0g			
<b>Cholesterol</b> 0mg			0%
<b>Sodium</b> 20mg			1%
<b>Total Carbohydrate</b> 47g			16%
Dietary Fiber 0g			0%
Sugars 44g			
<b>Protein</b> 0g			
Vitamin A	0%	Vitamin C	0%
Calcium	1%	Iron	3%
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:			
	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g
Calories per gram: Fat 9 • Carbohydrate 4 • Protein 4			
<b>Ingredients: Carbonated Water, High Fructose Corn Syrup, Caramel Color, Phosphoric Acid, Natural Flavors, Caffeine</b>			



## Carbohydrates

### History and Carbohydrates

- Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts. (CCSS.ELA-Literacy.RH.6-8.7)
- Distinguish among fact, opinion, and reasoned judgment in a text. (CCSS.ELA-Literacy.RH.6-8.8)
- Analyze the relationship between a primary and secondary source on the same topic. (CCSS.ELA-Literacy.RH.6-8.9)
- Students acquire a framework for thinking geographically, including the location and unique characteristics of places.
- Describe the influence of industrialization and technological developments on the region, including human modification of the landscape and how physical geography shaped human actions

#### DID YOU KNOW?

#### LESSONS IDEAS

#### INFORMATION AND CURRICULUM

#### ***Growing food...***

The primary grain crop grown in Asia was rice, Africa was barley, North America was wheat, South America was corn, and Europe was wheat.

Global grain production is expected to reach a record high of 2.37 billion tons\* World Watch Institute.

What are cereal crops?  
How have they been important throughout human history?  
What crops are primarily grown now?  
  
How has legislation influenced food production and food consumption?

***Crops, United States Department of Agriculture, Economic Research Service***  
[www.ers.usda.gov/topics/crops.aspx](http://www.ers.usda.gov/topics/crops.aspx)  
***Africa's Indigenous Crops***  
[www.worldwatch.org/system/files/NtP-Africa%27s-Indigenous-Crops.pdf](http://www.worldwatch.org/system/files/NtP-Africa%27s-Indigenous-Crops.pdf)  
***CHILD NUTRITION ACT OF 1966; Healthy, Hunger-Free Kids Act of 2010***  
[www.fns.usda.gov/cnd/Governance/legislation.htm](http://www.fns.usda.gov/cnd/Governance/legislation.htm)

#### ***Eating food...***

American's ate 110 pounds of sweeteners like sugar and corn syrup per person in 1950 and 152 pounds per person in 2000.

Compare the way children ate in other countries to the way children eat now. What are the differences and what caused them?  
  
Describe why fruits and vegetables are part of a healthy meal pattern in most cultures.

***Profiling Food Consumption in America, USDA***  
[www.usda.gov/factbook/chapter2.pdf](http://www.usda.gov/factbook/chapter2.pdf)  
  
***A Century of Data on Food Availability (Consumption), Economic Research Service, USDA***  
<http://webarchives.cdlib.org/sw1s17tt5t/>  
<http://ers.usda.gov/Features/Centennial/>

## Carbohydrates

### Science and Carbohydrate

- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (CCSS.ELA-Literacy.RST.6-8.7)
- Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (CCSS.ELA-Literacy.RST.6-8.8)
- Compare and contrast the information gained from experiments, simulations, video or multimedia sources with that gained from reading a text on the same topic. (CCSS.ELA-Literacy.RST.6-8.9)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><b><i>Growing food...</i></b> Plants use photosynthesis to make carbohydrates, which they store for a variety of uses throughout the plant. Carbohydrates make up the structure of the plants.</p>	<p>Compare the role of carbohydrates to plants versus humans. Why are these molecules important to both living organisms?</p>	<p><b><i>Empowering Youth with Nutrition and Physical Activity, Team Nutrition, USDA</i></b> <a href="http://teamnutrition.usda.gov/Resources/empoweringyouth.html">http://teamnutrition.usda.gov/Resources/empoweringyouth.html</a></p> <p><b><i>Power of Choice, Team Nutrition, USDA</i></b> <a href="http://teamnutrition.usda.gov/Resources/POC_intro.pdf">http://teamnutrition.usda.gov/Resources/POC_intro.pdf</a></p>
<p><b><i>Eating food...</i></b> Carbohydrates can be complex or simple. Glucose is the most simple, and eating sugary foods provides a quick boost of energy, but not lasting energy.</p>	<p>Understanding the complex text on a Nutrition Facts label will increase practical knowledge to make healthy food choices. Using the sample food labels, have students compare two foods.</p>	<p><b><i>Read It Before You Eat It, Team Nutrition, USDA</i></b> <a href="http://teamnutrition.usda.gov/Resources/readit_poster.pdf">http://teamnutrition.usda.gov/Resources/readit_poster.pdf</a></p> <p><b><i>Nutrition Voyager: TREK 2 Grade 7 Field Correspondents: Conducting a School Survey, Team Nutrition, USDA</i></b> <a href="http://teamnutrition.usda.gov/Resources/nutvoyage7_trek1.pdf">http://teamnutrition.usda.gov/Resources/nutvoyage7_trek1.pdf</a></p> <p><b><i>Center for Science in the Public Interest</i></b> <a href="http://www.cspinet.org/liquidcandy/">www.cspinet.org/liquidcandy/</a></p> <p><b><i>Supporting Urban Science &amp; math Educators</i></b> <a href="http://susmek12.wordpress.com/2011/02/10/carbohydrates/">http://susmek12.wordpress.com/2011/02/10/carbohydrates/</a></p>

# Carbohydrates

### Math and Carbohydrates

- Represent and analyze quantitative relationships between dependent and independent variables. (CCSSM.6.EE)
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations. (CCSSM.7.RP)
- Investigate patterns of association in bivariate data. (CCSSM.8.SP)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><b><i>Growing food...</i></b> Global grain production is at record highs despite extreme climatic events.</p>	<p>Chart and analyze global grain production and weather over time. Compare the cost of producing cereal crops based on inputs and outputs. What is the impact on the environment?</p>	<p><b><i>World Watch</i></b> <a href="http://vitalsigns.worldwatch.org/vs-trend/global-grain-production-record-high-despite-extreme-climatic-events">http://vitalsigns.worldwatch.org/vs-trend/global-grain-production-record-high-despite-extreme-climatic-events</a></p>
<p><b><i>Eating food...</i></b> 100 grams of wheat supply 449 calories whereas 100 grams of potatoes supply only 83 calories.</p>	<p>Compare the nutritive values of different cereal crops to each other and other plant foods like potato.  How much sugar is consumed in the USA? What percent of the American diet is due to sugar intake?</p>	<p><b><i>Adaptations of Cereals</i></b> <a href="http://www.cix.co.uk/~argus/Dreambio/fertilisers%20and%20crops/cereal%20crops.htm">www.cix.co.uk/~argus/Dreambio/fertilisers%20and%20crops/cereal%20crops.htm</a> <b><i>Team Nutrition Vegetable and Fruit Challenge</i></b> Identify, count and record daily consumption of produce. <a href="http://teamnutrition.usda.gov">http:// teamnutrition.usda.gov</a></p>
<p>On average, males consumed 2,475 calories daily and females consumed 1,833 calories in the USA (NHANES 1999–2000).</p>	<p>Graph and compare the consumption of carbohydrate foods of males and females over time.  Adolescent boys (12–19 years) consumed an average of 442 kcals from added sugars daily, whereas girls consumed 314 kcals daily. What percentage of adolescent males and females diets were from added sugar?</p>	<p><b><i>Profiling Food Consumption in America, USDA</i></b> <a href="http://www.usda.gov/factbook/chapter2.pdf">www.usda.gov/factbook/chapter2.pdf</a>  <b><i>Intake of Calories and Selected Nutrients for the United States Population, 1999-2000</i></b> <a href="http://www.cdc.gov/nchs/data/nhanes/databriefs/calories.pdf">www.cdc.gov/nchs/data/nhanes/databriefs/calories.pdf</a>  <b><i>Consumption of Added Sugar Among U.S. Children and Adolescents, 2005–2008.</i></b> <a href="http://www.cdc.gov/nchs/data/databriefs/db87.pdf">www.cdc.gov/nchs/data/databriefs/db87.pdf</a></p>

# Carbohydrates

### Language Arts and Carbohydrates

- Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (CCSS.ELA.W)
- Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (CCSS.ELA.SL)
- Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation. (CCSS.ELA.7.W)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><b>Growing food...</b> Hundreds of famous novels explore America's interesting agricultural history and the relationships of people to the farmland and food production.</p>	<p>Read <b>Oh! Pioneers</b> by Willa Cather, <b>Of Mice and Men</b> by John Steinbeck or <b>The Adventures of Tom Sawyer</b> by Mark Twain and write a paper on the impact of farming and food on the main characters.</p> <p>Compare farm life in several novels in the same or different time period.</p>	<p><b>History of Agriculture, National Agricultural Library, USDA</b> <a href="http://www.nal.usda.gov/history-art-and-biography/history-agriculture">www.nal.usda.gov/history-art-and-biography/history-agriculture</a></p> <p><b>Library Thing, Farming, Historical fiction</b> <a href="http://www.librarything.com/tag/farming,+historical+fiction">www.librarything.com/tag/farming,+historical+fiction</a></p>
<p><b>Eating food...</b> The average grocery store carries 38,718 items. 53% of grocery sales are of perishable food items. Consumers spent \$788.9 billion for food that originated on U.S. farms in 2004.</p>	<p>Create a consumer information brochure on topics such as food origin, cost of food in a healthy diet or selecting healthy diets (serving sizes, portion distortion, label reading).</p>	<p><b>Power of Choice, Team Nutrition, USDA</b> <a href="http://teammnutrition.usda.gov/Resources/POC_intro.pdf">http://teammnutrition.usda.gov/Resources/POC_intro.pdf</a></p> <p><b>Nutrition Voyager: TREK 3 Grade 7 Leading the Way as Change Agents, Team Nutrition, USDA</b> <a href="http://teammnutrition.usda.gov/Resources/nutvoyage7_trek3.pdf">http://teammnutrition.usda.gov/Resources/nutvoyage7_trek3.pdf</a></p> <p><b>MebMD, Weight Loss &amp; Diet Plans, Portion Size Plate</b> <a href="http://www.webmd.com/diet/healthtool-portion-size-plate">www.webmd.com/diet/healthtool-portion-size-plate</a></p> <p><b>Food Marketing Institute</b> <a href="http://www.fmi.org/">www.fmi.org/</a></p>

# Protein

### At a Glance

#### Recommended Dietary Intake:

55 g for adults = 220 calories  
Daily Calories in diet: 15-25%

#### Calories per Gram of Food: 4

3 oz piece of salmon = 19 g of protein = 76 calories; 10 g of fat = 90 cal; 0g carbohydrate; total calories = 166.

#### Types of Protein:

- 20 Amino Acids
  - 12 Human body makes
  - 8 “Essential” from food

**Function:** Proteins are involved in antibodies, blood clotting, energy, fluid balance, growth and repair of tissue, hormones, transportation of oxygen and minerals.

**Food Sources:** Meat, seafood, dairy, eggs, legumes, beans, tofu, nuts, seeds.

#### Typical Serving Size:

1 cup of black beans: 16 g protein, 40 g carbohydrate, 1 gm fat = 227 calories. 3 oz of meat (size of a deck of cards): 21 g protein, 16 g fat, 0 carbohydrate = 250 calories.

**Health Concerns:** Eating too little protein causes the body to break down tissue for amino acids while too much protein puts stress on the kidneys and gets stored as fat.

### Protein in the Body and Food

Protein is a macronutrient that provides the body with form (structures like muscle and tissue), function (enzymes, antibodies, hormones) and energy. The building blocks of protein are 20 amino acids that are combined in varying ways to give each protein its particular shape and function. When we ingest protein, stomach acids “denature” the protein freeing the amino acids, so the body can recycle them as needed. Eight of the amino acids, called “essential” amino acids must come from food because they can’t be synthesized by the body.

Protein in our diet comes from both animal and plant sources. Animal protein contains all the 20 amino acids needed by our bodies. It can also contain a significant quantity of fat and can be expensive. Plant protein also contains all the amino acids, but not all in one type of food. When a plant is deficient in one of the amino acids, another plant can make up the difference if eaten in combination, like beans and rice, to form a “complete” protein. The advantage of plant based protein is that it is naturally low in fat and inexpensive. In order for vegetarians to eat all the essential amino acids, they must eat a variety of complementary plants.



### Selecting a Diet of High Quality Protein

Be aware of several basic ideas when selecting food. Many animal sources of protein also have nutrients that should be limited like saturated fat, total fat, and cholesterol. Beef has more fat than chicken and pork. Processed meats like deli meat and sausage can be very high in fat, sodium and preservatives. The higher the fat content the higher the calorie content. Limit full fat dairy products. Seafood contains the health promoting omega-3 fatty acid. As a general rule, a 3 ounce serving of lean meat (the size of a deck of cards) is all the protein you need in a day.

Plant sources of protein include naturally low fat grains and legumes, but cooking technique and added ingredients can easily turn it into a high fat meal. Nuts and seeds while naturally higher in fat, have heart healthy fats, but should be eaten in moderation to avoid excess calories. Eating a variety of these foods provides all the amino acids your body needs.

## Protein

### Selecting Healthy Food Using Food Labels

**Goal:** Learn how to use the Nutrition Facts Label to select foods that are good sources of protein.

**Exercise:** The Food and Drug Administration requires a Nutrition Facts panel on all packaged food products. This exercise demonstrates how to read and interpret the label in order to compare different foods. Have the students compare the two nutrition fact labels below to determine the healthiest source of protein. Notice that the caloric content of the food is similar, as is the amount of protein. If you were only looking at protein on the label, you may think both were fine options. However, notice that the hot dog has much more fat, saturated fat, cholesterol, and sodium, and has no fiber. You must look at the entire label before evaluating which food is the better choice.

#### Black Beans

Nutrition Facts	
Serving Size 1 cup 172g (172 g)	
Amount Per Serving	
Calories 227	Calories from Fat 8
% Daily Value*	
Total Fat 1g	1%
Saturated Fat 0g	1%
Trans Fat	
Cholesterol 0mg	0%
Sodium 2mg	0%
Total Carbohydrate 41g	14%
Dietary Fiber 15g	60%
Sugars	
<b>Protein 15g</b>	
Vitamin A 0%	Vitamin C 0%
Calcium 5%	Iron 20%
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
	Calories 2,000 2,500
Total Fat	Less than 65g 80g
Sat Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Fiber	25g 30g
Calories per gram:	
Fat 9	Carbohydrate 4 Protein 4

#### Hot Dog

Nutrition Facts	
Serving Size 100 grams (100 grams)	
Amount Per Serving	
Calories 290	Calories from Fat 231
% Daily Value*	
Total Fat 26g	40%
Saturated Fat 11g	53%
Trans Fat	
Cholesterol 67mg	22%
Sodium 994mg	41%
Total Carbohydrate 2g	1%
Dietary Fiber 0g	0%
Sugars 2g	
<b>Protein 13g</b>	
Vitamin A 0%	Vitamin C 33%
Calcium 1%	Iron 10%
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
	Calories 2,000 2,500
Total Fat	Less than 65g 80g
Sat Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Fiber	25g 30g
Calories per gram:	
Fat 9	Carbohydrate 4 Protein 4



## Protein

### History and Protein

- Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts. (CCSS.ELA-Literacy.RH.6-8.7)
- Distinguish among fact, opinion, and reasoned judgment in a text. (CCSS.ELA-Literacy.RH.6-8.8)
- Analyze the relationship between a primary and secondary source on the same topic. (CCSS.ELA-Literacy.RH.6-8.9)

#### DID YOU KNOW?

#### LESSONS IDEAS

#### SUPPORTING INFORMATION AND CURRICULUM

#### **Growing food...**

We raise and slaughter 10 billion animals each year in the United States alone.

Global grain production that is fed to cattle could feed 8.7 billion people. Instead we feed it to cows.

How has raising animals been important throughout human history?  
What crops are primarily grown now to feed these animals (corn and soy)?

How has legislation influenced food production and food consumption?

**Crops, United States Department of Agriculture, Economic Research Service**

[www.ers.usda.gov/topics/crops.aspx](http://www.ers.usda.gov/topics/crops.aspx)

**Animal Products, United States Department of Agriculture, Economic Research Service**

[www.ers.usda.gov/topics/animal-products.aspx](http://www.ers.usda.gov/topics/animal-products.aspx)

#### **Eating food...**

American's eat about 110 grams of protein a day, 75 of which come from animal sources. The USDA recommends just 55 grams per day, and the majority from non-animal or lean animal sources.

Compare the way children ate in other countries to the way children eat now. What are the differences and what caused them.

Describe what sources of protein developing nations rely on (black beans in Latin America, rice and chickpeas in India, peanuts in Western Africa, seal blubber in Inuit cultures).

How much protein do you eat as compare to your ancestors?

**Profiling Food Consumption in America, USDA**

[www.usda.gov/factbook/chapter2.pdf](http://www.usda.gov/factbook/chapter2.pdf)

**A Century of Data on Food Availability (Consumption), Economic Research Service, USDA**

<http://webarchives.cdlib.org/sw1s17tt5t/http://ers.usda.gov/Features/Centennial/>

**Global and regional food consumption patterns/trends, WHO**

[www.who.int/nutrition/topics/3\\_foodconsumption/en/index.html](http://www.who.int/nutrition/topics/3_foodconsumption/en/index.html)

**Team Nutrition, USDA, Serving Up MyPlate: A Yummy Curriculum**

[http://teamn nutrition.usda.gov/Resources/sump\\_level3.pdf](http://teamn nutrition.usda.gov/Resources/sump_level3.pdf)

## Protein

### Science and Protein

- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (CCSS.ELA-Literacy.RST.6-8.7 )
- Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (CCSS.ELA-Literacy.RST.6-8.8)
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (CCSS.ELA-Literacy.RST.6-8.9 )

#### DID YOU KNOW?

##### **Growing food...**

In ecology, with each movement up a food chain only 10% of the original energy is maintained – the other 90% goes to the functioning of the organism. For example, from grass eaten by rabbit, only 10% of the energy in the grass becomes energy in the rabbit’s flesh. From rabbit eaten by fox, only 10% of the rabbit becomes energy, so 1% of the original grass energy is passed on.

##### **Eating food...**

The human body has the ability to construct thousands of proteins as needed to perform vital functions from 20 amino acids. Eight of the amino acids are considered “essential,” meaning the body cannot make them and must obtain them from both plant and animal foods.

#### LESSONS IDEAS

Discuss food chains and how they are important in ecology. Go over the concept of energy maintenance as one moves along a food chain. Why is only 10% of the energy retained? Where does the other 90% go? Have students create a food web diagram for an ecosystem (eg Chesapeake Bay). Then have students make a food web for human beings. What do we eat? Only meat? Only plants? Both?

Understanding the complex text on a Nutrition Facts label will increase practical knowledge to make healthy food choices. Using the sample food labels, have students compare two foods and identify healthy snacks.

Discuss the composition of protein molecules and why they are unique. Discuss what an enzyme is and why protein is important.

#### INFORMATION AND CURRICULUM

##### **Chesapeake Bay Field Office: Food Web Activity**

[www.fws.gov/chesapeakebay/Shad%20activities/ShadFoodWeb.html](http://www.fws.gov/chesapeakebay/Shad%20activities/ShadFoodWeb.html)

##### **Energy Transfer Worksheet**

[http://science-class.net/Graphic\\_Organizers/GO\\_energy\\_transfer.pdf](http://science-class.net/Graphic_Organizers/GO_energy_transfer.pdf)

##### **More Food Web Activities/Resources**

[http://science-class.net/Ecology/energy\\_transfer.htm](http://science-class.net/Ecology/energy_transfer.htm)

##### **Basics of Protein, CDC**

[www.cdc.gov/nutrition/everyone/basics/protein.html](http://www.cdc.gov/nutrition/everyone/basics/protein.html)

##### **Team Nutrition, USDA, Nutrition Voyager, Trek 2, Backpack full of Snacks**

[teamnutrition.usda.gov/Resources/nutvoyage8\\_trek2.pdf](http://teamnutrition.usda.gov/Resources/nutvoyage8_trek2.pdf)

##### **MyPlate Protein Lesson, Ole Miss**

<http://nfsmi-web01.nfsmi.olemiss.edu/documentlibraryfiles/PDF/20110831094457.pdf>

## Protein

### Math and Protein

- Represent and analyze quantitative relationships between dependent and independent variables. (CCSSM.6.EE)
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations. (CCSSM.7.RP)
- Investigate patterns of association in bivariate data. (CCSSM.8.SP)

#### DID YOU KNOW?

##### *Growing food...*

Global meat production is at record high with 58 billion animals raised worldwide each year  
Many students don't know where food is grown.

##### *Eating food...*

One serving of beef has 200 calories, 13 grams of fat, 5 grams saturated fat, and 19 grams of protein while one serving of black beans has no fat, 200 calories, 15 grams of protein and 15 grams of fiber

On average Americans consume 300 calories daily from the protein in animal foods, which account for about ¼ of the total daily caloric intake of the average American. Another 40% of calories come just from added fat and sugar in products!

#### LESSONS IDEAS

Chart and analyze global meat and animal products production.  
Compare cost of producing animal foods based on outputs and inputs. (impact on environment)  
Identify local food production

Compare the nutritive values of different sources of protein including both animal and plant sources  
How many grams of protein are consumed in the USA? What percent of the American diet is due to protein? Graph with pie charts.

Graph and compare the consumption of foods (containing nutrients like protein) of males and females over time.

Adolescent boys (12–19 years) consumed an average of 442 kcals from added sugars daily whereas girls consumed 314 kcals daily. What percentage of adolescent males and females diets were from added sugar?

#### INFORMATION AND CURRICULUM

##### *This Land is Our Land, Lesson Plan*

[www.nass.usda.gov/Education\\_and\\_Outreach/Lesson\\_Plans/X-09-this%20land%20is%20our%20land.pdf](http://www.nass.usda.gov/Education_and_Outreach/Lesson_Plans/X-09-this%20land%20is%20our%20land.pdf)  
**Team Nutrition, USDA, Nutrition Voyager, Trek 3 From Farm to You**  
[http://teamnutrition.usda.gov/Resources/nutvoyage8\\_trek3.pdf](http://teamnutrition.usda.gov/Resources/nutvoyage8_trek3.pdf)

##### *Plant Protein vs. Animal Protein, Difference Between*

[www.differencebetween.net/science/health/difference-between-plant-protein-and-animal-protein/](http://www.differencebetween.net/science/health/difference-between-plant-protein-and-animal-protein/)  
**How Much Protein Do We Need? CDC**  
[www.cdc.gov/nutrition/everyone/basics/protein.html](http://www.cdc.gov/nutrition/everyone/basics/protein.html)

##### *Big Math and Fries, Illuminations*

[illuminations.nctm.org/LessonDetail.aspx?id=L849](http://illuminations.nctm.org/LessonDetail.aspx?id=L849)  
**Using Food to Teach Pie Graphs**  
[http://wikieducator.org/Sample\\_math\\_lesson](http://wikieducator.org/Sample_math_lesson)  
**Using Nutrition Labels to Teach Math, ehow**  
[www.ew.com/info\\_7877480\\_math-activities-using-nutrition-labels.html](http://www.ew.com/info_7877480_math-activities-using-nutrition-labels.html)  
**Nutrition Essentials, MyPyramid Amounts of Foods—FOR YOU, Team Nutrition, USDA**  
[http://teamnutrition.usda.gov/Resources/ne\\_amounts4u.pdf](http://teamnutrition.usda.gov/Resources/ne_amounts4u.pdf)

## Protein

### Language Arts and Protein

- Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (CCSS.ELA.W)
- Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (CCSS.ELA.SL)
- Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation. (CCSS.ELA.7.W)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><b><i>Growing food...</i></b> There are many great documentaries on the subject of food production, such as "Food Inc.," "King Corn" and "Fresh."</p>	<p>Watch films about food and discuss the differences between opinion and fact. Have students take notes and prepare to engage in a debate for each side displayed in the films.</p>	<p><b><i>Teaching the Food System, Johns Hopkins University</i></b> <a href="http://www.jhsph.edu/research/centers-and-institutes/teaching-the-food-system/curriculum/">www.jhsph.edu/research/centers-and-institutes/teaching-the-food-system/curriculum/</a> <b><i>Historical Timeline, Farm Machinery, Growing a Nation</i></b> <a href="http://www.agclassroom.org/gan/timeline/farm_tech.htm">www.agclassroom.org/gan/timeline/farm_tech.htm</a></p>
<p><b><i>Eating food...</i></b> Many countries have food guides that capture the ethnic and cultural characteristics of that country while conveying recommendations based on nutrition science.</p>	<p>Search for a variety of pictorial food guides and compare how different foods are categorized and displayed. What can you learn about each country? Do they place an emphasis on plant based foods or animal based foods?</p> <p>Make your own food guide that represents a healthy diet within your community.</p>	<p><b><i>MyPlate, Protein, USDA</i></b> <a href="http://www.choosemyplate.gov/food-groups/protein-foods.html">www.choosemyplate.gov/food-groups/protein-foods.html</a> <b><i>Comparison of International Food Guide Pictorial Representation</i></b> <a href="http://intraspec.ca/pictorials_nutrition_guides.pdf">http://intraspec.ca/pictorials_nutrition_guides.pdf</a> <b><i>Harvard Healthy Eating Plate, Harvard University</i></b> <a href="http://www.hsph.harvard.edu/nutritionsource/healthy-eating-plate/">www.hsph.harvard.edu/nutritionsource/healthy-eating-plate/</a> <b><i>Japanese Food Guide Spinning Top</i></b> <a href="http://www.mhlw.go.jp/bunya/kenkou/pdf/eiyousyokuji5.pdf">www.mhlw.go.jp/bunya/kenkou/pdf/eiyousyokuji5.pdf</a></p>

# Lipids: Fat and Oil

### At a Glance

#### Recommended Dietary Intake:

30 g for adults = 270 calories

% of Daily Calories: 15-25%

#### Calories per Gram of food: 9

For example, a 1 oz serving of peanuts has 14 grams of fat which equals 126 calories

#### Types of Lipids (commonly referred to as “fat”):

- Saturated
- Unsaturated
  - Monounsaturated
  - Polyunsaturated
- Essential Fatty Acids (Omega-3 and Omega-6)
- Trans-Fatty Acids

**Function:** Dietary and stored fat provides about half of the body’s energy needs during rest and light activity. Fat is the main energy storage molecule. Layers of fat protect vital organs. Vitamins A, D, E, and K are fat-soluble and need fat to be absorbed into the body.

**Food Sources:** Meat, seafood, dairy, nuts, seeds, oils, olives, avocados, processed food.

**Typical Serving size:** ½ of a filet of salmon contains 13 g of fat

**Health Concerns:** Too much fat intake can contribute to obesity, adult onset diabetes, heart disease, stroke and some cancers.

### Fat in the Body and Food

Contrary to popular belief, dietary fat is vital to human life. Fat is the most abundant and efficient form of energy storage in the body and is used for muscles at rest and light activity. In addition, fat surrounds and protects vital organs, and insulates us from cold.

Most cell membranes have a fat layer. Highest quantities are found in animal products and highly processed foods. This does not mean that all fat is created equal, however. Healthy fats are unsaturated, and mostly come from plant sources, like nuts, seeds, and fatty fruits like avocados.

Other healthy fats come from fish and seafood, such as salmon, tuna, or shellfish, and plants such as flax seeds or walnuts. These foods contain an essentially fatty acid, known as omega-3, which is important in cognitive development and functioning. The omega-6 fatty acids are found in abundance in the typical American diet,



### What fats should be eaten or avoided?

While fat is essential to human life, not all fat is created equal. “Bad” fats or fats that should be limited come in the form of saturated and trans-fats. Saturated fats can be found in abundance in certain animal products, such as red meat, poultry, seafood, and dairy products like cheese. Choosing leaner options of all of these foods is recommended.

Artificial trans-fats are a byproduct of the process of making a solid fat out of a liquid fat, such as hydrogenated vegetable oils. This improves the texture, shelf life, and flavor of the fat. These fats are used in many processed and restaurant foods. However researchers discovered that trans-fats have similar negative health impacts as saturated fats and are considered more dangerous. As a result, the FDA requires that trans-fats be listed on food labels. In addition, some cities have banned it from all restaurant food, and many food processors have eliminated trans-fats from their foods.

Read food labels and try reducing total fat consumption, especially trans- and saturated fats. With 9 calories per gram, reducing fat is a great way to decrease total calorie consumption and to reduce body weight.

## Lipids: Fat and Oil

### Selecting Healthy Food Using Food Labels

**Goal:** Learn how to use the Nutrition Facts Label to select foods that are low in fat.

**Exercise:** The Food and Drug Administration requires a nutrition facts panel on all packaged food products. This exercise demonstrates how to read and interpret the label in order to compare different foods. Have your students compare the two nutrition fact labels below to assess the fat information on the label. Notice that the fat content of 1 ounce of peanuts is similar to the snickers bar. Notice the serving size. Is it how much you would eat in one sitting? Then notice that the snickers bar has much more saturated fat, sugar, and sodium than the peanuts. Also, because they are low in saturated fat, the peanuts have “healthier” fats. Also, notice how many ingredients are in the snickers bar. This exercise shows students that you must look at the entire label before evaluating which foods are healthy or not.

#### Peanuts

Nutrition Facts			
Serving Size 1 ounce 28g (1 ounce (28g))			
Amount Per Serving			
Calories 159		Calories from Fat 115	
% Daily Value*			
Total Fat	14g		21%
Saturated Fat	2g		10%
Trans Fat			
Cholesterol	0mg		0%
Sodium	5mg		0%
Total Carbohydrate	5g		2%
Dietary Fiber	2g		10%
Sugars	1g		
<b>Protein 7g</b>			
Vitamin A	0%	Vitamin C	0%
Calcium	3%	Iron	7%
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:			
	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g
Calories per gram: Fat 9 • Carbohydrate 4 • Protein 4			
©www.NutritionData.com			

Ingredients: Peanuts

#### Snickers Bar

Nutrition Facts			
Serving Size 1 bar 2 oz 57g (57 g)			
Amount Per Serving			
Calories 271		Calories from Fat 122	
% Daily Value*			
Total Fat	14g		21%
Saturated Fat	5g		26%
Trans Fat	0g		
Cholesterol	7mg		2%
Sodium	140mg		6%
Total Carbohydrate	35g		12%
Dietary Fiber	1g		5%
Sugars	29g		
<b>Protein 4g</b>			
Vitamin A	2%	Vitamin C	0%
Calcium	5%	Iron	2%
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:			
	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g
Calories per gram: Fat 9 • Carbohydrate 4 • Protein 4			
©www.NutritionData.com			

Ingredients: Milk chocolate (sugar, cocoa butter, chocolate, skim milk, lactose, milk fat, soy lecithin, artificial flavor), peanuts, corn syrup, sugar, milk fat, skim milk, partially hydrogenated soybean oil, lactose, salt, egg whites,

# Lipids: Fat and Oil

### History and Lipids

- Identify key steps in a text’s description of a process related to history/social studies. (CCSS.ELA-Literacy.RH.6-8.4)
- Describe how a text presents information (e.g., sequentially, comparatively, causally). (CCSS.ELA-Literacy.RH.6-8.5)
- Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies. (CCSS.ELA-Literacy.RH.6-8.4)

#### DID YOU KNOW?

#### LESSONS IDEAS

#### INFORMATION AND CURRICULUM

#### ***Growing food...***

Foodways is the historical study of the role of food, farming and culture in society. Fat has come from many animal and plant sources in different societies depending on resources, affluence, culture, etc.

Discuss various cultures around the world and compare and contrast the predominant fat in their diets (i.e. animal vs. plant, soy vs. palm, nuts vs. olives, etc.)  
Research the history of “soul food” and the the reason it tends to be high in fat.

What is the history of vegetable oil production worldwide? Research the techniques used to extract oils from the seeds of the various crops used.

***Canola Oil, United States Department of Agriculture, Economic Research Service***

[www.ers.usda.gov/topics/crops/soybeans-oil-crops/canola.aspx#.UVCCHs4Xqw](http://www.ers.usda.gov/topics/crops/soybeans-oil-crops/canola.aspx#.UVCCHs4Xqw)

***The Cooking Gene, preserving and promoting African American foodways***

<http://thecookinggene.com/>

***The Food Museum, Exploring and Celebrating Food***

<http://foodmuseum.com/>

#### ***Eating food...***

Americans eat about 30% of their daily calories from fat. The USDA recommends between 20 and 35%. While most Americans are in this range, the proportion of saturated fat is too high.

What were the primary sources of fat in the American diet 100 years ago and how do they compare to today?

Describe what sources of fat other nations rely on (olives and nuts in the Mediterranean, animal and processed/added in the US, peanuts in Western Africa, seal blubber in Inuit cultures).

***Profiling Food Consumption in America, USDA***

[www.usda.gov/factbook/chapter2.pdf](http://www.usda.gov/factbook/chapter2.pdf)

***Global and regional food consumption patterns/trends, WHO***

[www.who.int/nutrition/topics/3\\_foodconsumption/en/index2.html](http://www.who.int/nutrition/topics/3_foodconsumption/en/index2.html)

***Team Nutrition, USDA, Serving Up MyPlate: A Yummy Curriculum***

[http://teamnutrition.usda.gov/Resources/sump\\_level3.pdf](http://teamnutrition.usda.gov/Resources/sump_level3.pdf)

# Lipids: Fat and Oil

### Science and Lipids

- Cite specific textual evidence to support analysis of science and technical texts.(CCSS.ELA-Literacy.RST.6-8.1)
- Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.(CCSS.ELA-Literacy.RST.6-8.5)
- Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. (CCSS.ELA-Literacy.RST.6-8.6 )

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><b>Growing food...</b></p> <p>As in humans, plants produce fats as a way to store energy. Typically, fats in plants are centralized in the seeds. Due to the high energy content of fatty acids, more energy can be stored in a smaller volume. When the seed germinates, these fats can be converted to carbohydrate for energy to help the seed grow.</p>	<p>Discuss why fats and oils are important to both plants and animals, including humans. How do people use fat in a similar way to plants? What types of fats are found in animal foods and how do they differ from plant foods?</p> <p>Have students read Britannica entry on fats and discuss structure and point of view.</p>	<p><b>Plant Oils and Fats</b> <a href="http://www.cyberlipid.org/glycer/glyc0005.htm">www.cyberlipid.org/glycer/glyc0005.htm</a></p> <p><b>Britannica, Fats</b> <a href="http://www.britannica.com/EBchecked/topic/202365/fat">www.britannica.com/EBchecked/topic/202365/fat</a></p> <p><b>Kids Health, Lesson Plan, Fats</b> <a href="http://kidshealth.org/kid/nutrition/food/fat.html">http://kidshealth.org/kid/nutrition/food/fat.html</a></p>
<p><b>Eating food...</b></p> <p>While there are many different fatty acids in the typical human diet, only two are known to be “essential,” meaning they cannot be produced by the body and must be consumed from food - omega-3 and omega-6 fatty acids.</p> <p>Each are polyunsaturated fats. Other types include monounsaturated, saturated, and trans-fatty acids. Unsaturated fats are liquid at room temperature, while saturated fats are solid at room temperature.</p>	<p>Compare the chemical difference between saturated and unsaturated fatty acids. Why are saturated fats solid at room temperature versus liquid unsaturated fats?</p> <p>Read the article on essential fatty acids from PCRM and analyze the author’s point of view</p>	<p><b>Basics of Fats, CDC</b> <a href="http://www.cdc.gov/nutrition/everyone/basics/fat/index.html">www.cdc.gov/nutrition/everyone/basics/fat/index.html</a></p> <p><b>Essential Fatty Acids, PCRM</b> <a href="http://www.pcrm.org/health/health-topics/essential-fatty-acids">www.pcrm.org/health/health-topics/essential-fatty-acids</a></p> <p><b>Affairs of the Heart Lesson Plan, PBS</b> <a href="http://www.pbs.org/saf/1104/teaching/teaching3.htm">www.pbs.org/saf/1104/teaching/teaching3.htm</a></p>

# Lipids: Fat and Oil

### Math and Lipids

- Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). (CCSSM.6.EE.4)
- Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. (CCSSM.7.RP.1)
- Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. (CCSSM.8.SP.1)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><b><i>Growing food...</i></b> Global production of palm and soybean oil amounts to 41 million metric tons annually for each. The US produces about 1 million metric tons of corn oil, largely for use in processed goods.</p>	<p>A farmer will yield about 135 pounds of corn oil per acre grown. How many acres are needed to produce 1 million tons of corn oil in the US? Soybeans produce 345 pounds of oil per acre while palm produces a whopping 4,585 pounds per acre. What are the acreages needed to meet global demand for these oils?</p>	<p><b><i>Ten Oil Producing Crops Yield Table, Autonopedia</i></b> <a href="http://autonopedia.org/renewable-energy/biofuels/grow-your-own-fuel/">http://autonopedia.org/renewable-energy/biofuels/grow-your-own-fuel/</a></p> <p><b><i>Team Nutrition, USDA, Nutrition Voyager, Trek 3 From Farm to You</i></b> <a href="http://teamnutrition.usda.gov/Resources/nutvoyage8_trek3.pdf">http://teamnutrition.usda.gov/Resources/nutvoyage8_trek3.pdf</a></p>
<p><b><i>Eating food...</i></b> Due to the high caloric content of fat, at 9 kcal per gram, the most concentrated source of calories in any diet is added oils. Just one tablespoon of olive oil contributes 125 calories and 14 grams of fat.</p>	<p>Bring in wrappers from various processed foods and calculate ratio of calories from fat versus total calories in product. Plot percentages on graphs with labels to illuminate high fat food products. How many grams of fat are consumed in the USA? What percent of the American diet is due to fat? Graph with pie charts.</p>	<p><b><i>A Century of Data on Food Availability (Consumption), Economic Research Service, USDA</i></b> <a href="http://webarchives.cdlib.org/sw1s17tt5t/http://ers.usda.gov/Features/Centennial/">http://webarchives.cdlib.org/sw1s17tt5t/http://ers.usda.gov/Features/Centennial/</a></p> <p><b><i>Global and regional food consumption patterns/trends, WHO</i></b> <a href="http://www.who.int/nutrition/topics/3_foodconsumption/en/index2.html">www.who.int/nutrition/topics/3_foodconsumption/en/index2.html</a></p>
<p>On average, Americans consume 600 calories daily from fats, which account for about 30% of the total daily caloric intake of the average American.</p>	<p>Adolescent youths (12–19 years) consumed an average of 40% of their daily calories from added sugar and fat. How many total calories do youths consume from each?</p>	<p><b><i>Using Food to Teach Pie Graphs</i></b> <a href="http://wikieducator.org/Sample_math_lesson">http://wikieducator.org/Sample_math_lesson</a></p> <p><b><i>Using Nutrition Labels to Teach Math, ehow</i></b> <a href="http://www.ehow.com/info_7877480_math-activities-using-nutrition-labels.html">www.ehow.com/info_7877480_math-activities-using-nutrition-labels.html</a></p>

# Lipids: Fat and Oil

### Language Arts and Lipids

- Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. (CCSS.6.RL)
- Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. (CCSS.6.W)
- Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation. (CCSS.6.SL)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><b><i>Growing food...</i></b> The American food system is a complex process of delivering food from seed to table in an affordable, safe way. Technology, war, consumerism and policy are some of the factors that have influenced the system.</p>	<p>Decide on a food system theme and write a paper or prepare a debate.</p> <p>Watch food films, podcasts or read blogs about farming and then discuss the differences between opinion and fact.</p> <p>Visit the National Agricultural Library or the Agricultural Research Service National Visitors Center in Beltsville MD</p>	<p><b><i>Teaching the Food System, Johns Hopkins University</i></b> <a href="http://www.jhsph.edu/research/centers-and-institutes/teaching-the-food-system/curriculum/">www.jhsph.edu/research/centers-and-institutes/teaching-the-food-system/curriculum/</a></p> <p><b><i>Growing a Nation, The Story of American Agriculture</i></b> <a href="http://www.agclassroom.org/gan/inst_unit.htm">www.agclassroom.org/gan/inst_unit.htm</a> <a href="http://www.agclassroom.org/gan/pdf/inst_unit.pdf">www.agclassroom.org/gan/pdf/inst_unit.pdf</a></p> <p><b><i>Escape Fire, CNN</i></b> <a href="http://www.cnn.com/SPECIALS/health/escape-fire-documentary">www.cnn.com/SPECIALS/health/escape-fire-documentary</a></p>
<p><b><i>Eating food...</i></b> Classic literature, like works of Charles Dickens, Jane Austen and Oscar Wilde, has frequent references to farming, food and cooking, and those experiences help us understand the characters, the settings and the historical context.</p>	<p>Notice the food references in the poems and novels being read and do research that helps students understand the broader context.</p> <p>Compare food guides from different countries to understand how a healthy diet is promoted. How do the fat recommendations differ? Have students fill out a blank MyPlate with their favorite sources of healthy fats from the list.</p>	<p><b><i>MyPlate, Oils, USDA</i></b> <a href="http://www.choosemyplate.gov/food-groups/oils.html">www.choosemyplate.gov/food-groups/oils.html</a></p> <p><b><i>Harvard Healthy Eating Plate, Harvard University</i></b> <a href="http://www.hsph.harvard.edu/nutritionsource/healthy-eating-plate/">www.hsph.harvard.edu/nutritionsource/healthy-eating-plate/</a></p> <p><b><i>Japanese Food Guide Spinning Top</i></b> <a href="http://www.mhlw.go.jp/bunya/kenkou/pdf/eiyousyokuji5.pdf">www.mhlw.go.jp/bunya/kenkou/pdf/eiyousyokuji5.pdf</a></p> <p><b><i>Research Food Guides from Around the World!</i></b></p>

## Minerals

### At a Glance

#### Recommended Dietary Intake:

Each mineral has a Recommended Dietary Allowance for a daily intake as indicated by the % Daily Value on food labels

#### Calories per Gram of Food: 0

Minerals are elements that cannot be broken down or destroyed; therefore, they do not provide calories to the body

#### Types of Minerals:

Major Dietary Minerals: Calcium, Phosphorous, Potassium, Sodium, Chloride, Magnesium, Sulfate

Trace Dietary Minerals: Iron, Iodine, Zinc, Chromium, Selenium, Fluoride, Molybdenum, Copper, Manganese

**Function:** Minerals are essential to the normal functioning of the human body. They help our bodies build strong bones, make new blood cells, and serve many other important roles.

**Food Sources:** dairy, fruits, vegetables, whole grains, nuts, seeds, beans, meat, seafood

**Typical Serving Size:** 1 cup of collard greens has 268 g or 27% of your daily calcium

**Health Concerns:** A deficiency in a mineral can cause a mild to serious health concern. Iron, calcium and magnesium deficiencies are common in the US.

### Minerals in the Body and Food

The food we eat contains important minerals essential to life. Minerals are very important in many different functions throughout the body. Without adequate mineral intake, your body would not be able to grow and make new cells. Some of the most important minerals are calcium, iron, and potassium.

Calcium is vital to growing healthy bones for young people, and maintaining healthy bones in adults. Good sources of calcium are dark leafy green vegetables, soybeans, and dairy products. Iron is another very important mineral. Getting enough iron in our diet is important in making new blood cells, as each cell needs iron. Good sources include beans, soybeans, nuts and seeds, dark leafy vegetables, and some animal products. While these minerals are especially important, each of the major and trace minerals are essential to a healthy diet.



### Selecting a Diet High in Minerals

As with the other nutrients, a diet high in unprocessed, well prepared food will provide the body with the most bioavailable minerals with the fewest extra calories. Processed foods have become so abundant in the American diet that the balance of fat to micronutrients is contributing to a diet with too many calories and too few nutrients. Processing food can decrease minerals, vitamins and fiber by using techniques such as milling, baking or boiling. Many of the wheat products we consume are made with white flour. In order to make white flour, the grain is milled to eliminate the germ and in the process the fiber and most of the vitamins, minerals, and phytonutrients are destroyed.

Cooking a food can increase the quantity you can eat in one serving, and thus the amount of minerals consumed. For example, 1 cup of raw spinach has 3% of the daily value for calcium, while 1 cup boiled spinach has 24% because you are eating more spinach.

Eating whole fruits is better than drinking juice since juice often has added sugar, no fiber and fewer micronutrients. Choosing raw or lightly cooked foods is healthier than consuming their processed counterpart. Check the price too to compare the quality of the nutrients to the cost of the product.

### Selecting Healthy Food Using Food Labels

**Goal:** Learn how to use the Nutrition Facts label to compare food mineral content.

**Exercise:** The Food and Drug Administration requires a nutrition facts panel on all packaged food products. This exercise demonstrates how to read and interpret the label in order to compare foods. Notice that the per serving caloric content of the food is similar; however, the whole potato contains a lot more iron, vitamin C and fiber, less sodium and no fat. Note that while the serving size for the potato is realistic, a person might easily eat 3 or 4 times the serving size of chips. In this case, multiply all nutrients by the number of servings and you will see that the number of calories, fat and salt increase dramatically. Finally, look at the ingredients list. In this case, the chips have fat and salt added in processing. By looking at all the information on the label, you can see that the potato is nutrient dense with fewer of the nutrients that should be limited in a healthy diet like salt and fat.

#### Potato

Nutrition Facts	
Serving Size 1 potato medium 173g (173 g)	
Amount Per Serving	
Calories 161	Calories from Fat 2
% Daily Value*	
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat	
Cholesterol 0mg	0%
Sodium 17mg	1%
Total Carbohydrate 37g	12%
Dietary Fiber 4g	15%
Sugars 2g	
Protein 4g	
Vitamin A 0%	Vitamin C 28%
Calcium 3%	Iron 10%

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

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

Ingredients: Potato



#### Potato Chips

Nutrition Facts	
Serving Size 1 ounce 28g (1 ounce (28g))	
Amount Per Serving	
Calories 153	Calories from Fat 92
% Daily Value*	
Total Fat 10g	16%
Saturated Fat 3g	15%
Trans Fat	
Cholesterol 0mg	0%
Sodium 147mg	6%
Total Carbohydrate 14g	5%
Dietary Fiber 1g	5%
Sugars 0g	
Protein 2g	
Vitamin A 0%	Vitamin C 9%
Calcium 1%	Iron 3%

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

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

Ingredients: Potatoes, Canola Oil, Salt



## Minerals

### History and Minerals

- Identify key steps in a text's description of a process related to history/social studies. (CCSS.ELA-Literacy.RH.6-8.4)
- Describe how a text presents information (e.g., sequentially, comparatively, causally). (CCSS.ELA-Literacy.RH.6-8.5)
- Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies. (CCSS.ELA-Literacy.RH.6-8.4)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><b>Growing food...</b> During colonial times, one farmer fed four people. Today, one farmer produces food for 130 people. Agricultural advances have enabled farmers to grow more food from less land, but the health of the environment such as the soil and water has suffered.</p>	<p>How did early Americans, Colonists, traders and farmers influence food production? What types of growing practices impact the environment? How is soil quality measured and managed? What is the impact on mineral content of food?</p> <p>Discuss various countries around the world and compare and contrast their soil preservation techniques. What crops do we grow in the US compared to a developing nation? What techniques are utilized?</p>	<p><b>Sciences of Life Explorations: Through Agriculture, Let's Explore Agriculture</b> <a href="http://www.agclassroom.org/ny/resources/pdf/activities/explore.pdf">www.agclassroom.org/ny/resources/pdf/activities/explore.pdf</a></p> <p><b>Soil: Educational Resources, www.Soils.org</b> <a href="http://www.soils.org/about-soils/lessons/resources">www.soils.org/about-soils/lessons/resources</a></p>
<p><b>Eating food...</b> The salt industry started in 1614 by Jamestown colonist and now the US produces 46 million tons a year.</p> <p>Minerals in the diet come from plant and animal sources. Calcium is most associated with dairy products, but is also abundant in leafy green vegetables. Iron, most associated with meat, is found in abundance in beans.</p>	<p>Salt is one of the most important compounds in history. A crystal of 2 minerals, sodium and chloride, salt has had a tremendous economic and military significance throughout the history of the world. What role has it played in trade, food preservation, religion and industry? What impact does it have on human health?</p>	<p><b>The History of Salt, Salt Institute</b> <a href="http://www.saltinstitute.org/Uses-benefits/Salt-in-history">www.saltinstitute.org/Uses-benefits/Salt-in-history</a></p> <p><b>History of Salt, Salt Works</b> <a href="http://www.saltworks.us/salt_info/si_HistoryOfSalt.asp">www.saltworks.us/salt_info/si_HistoryOfSalt.asp</a></p> <p><b>Food History Lesson Plans, Food Timeline</b> <a href="http://www.foodtimeline.org/food2a.html">www.foodtimeline.org/food2a.html</a></p>

# Minerals

### Science and Minerals

- Cite specific textual evidence to support analysis of science and technical texts. (CCSS.ELA-Literacy.RST.6-8.1)
- Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. (CCSS.ELA-Literacy.RST.6-8.5)
- Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. (CCSS.ELA-Literacy.RST.6-8.6 )

#### DID YOU KNOW?

#### ***Growing food...***

We eat rocks with the help of plants and animals! Minerals are part of the soil in which we grow crops. These dissolved minerals are taken up by plants. When an animal, like a human or cow, eats the plant, some of the minerals are absorbed.

Humans have the capability to add minerals to food products. In nature, sometimes mammals will lick mineral deposits like “salt licks,” to meet their mineral needs.

#### ***Eating food...***

Deficiencies in minerals can cause mild to severe symptoms. For example, a deficiency of iron in our diets can lead to anemia which causes us to feel tired. Insufficient calcium can contribute to the bone disease osteoporosis.

#### LESSONS IDEAS

Discuss the role of minerals in a natural ecosystem. Where do they originate? Trace the absorption of minerals in the digestive track. Lead the “What’s In My Soil” lesson from the USGS and the many lessons in “Soil and Life on Earth”

What are some of the functions of the major minerals in our bodies like calcium, iron and salt? What causes deficiencies?  
Research foods that provide adequate mineral intake and make a diet plan.  
  
Play the “Nutrition Sleuth” game with students.

#### INFORMATION AND CURRICULUM

#### ***What’s In My Soil, USGS***

[www.education.usgs.gov/lessons/soil.pdf](http://www.education.usgs.gov/lessons/soil.pdf)

#### ***Soil and Life on Earth, Bush Middle School***

[www.wscss.org/web\\_docs/Lake\\_Chelan\\_Retreat/Lessons/LowdownOnDirtCURRICULUM.pdf](http://www.wscss.org/web_docs/Lake_Chelan_Retreat/Lessons/LowdownOnDirtCURRICULUM.pdf)

#### ***Mineral Deficiency, Right Diagnosis***

[www.rightdiagnosis.com/m/mineral/](http://www.rightdiagnosis.com/m/mineral/)

#### ***MedLine Plus, Minerals***

[www.nlm.nih.gov/medlineplus/minerals.html#cat47](http://www.nlm.nih.gov/medlineplus/minerals.html#cat47)

#### ***Good Food, Good Health, ScienceNetLinks***

<http://sciencenetlinks.com/lessons/nutrition-2-good-food-good-health/>

#### ***Nutrition Sleuth, Pacific Science Center***

[www.pacificsciencecenter.org/nutrition/nutrition\\_affe.html](http://www.pacificsciencecenter.org/nutrition/nutrition_caffe.html)

## Minerals

### Math and Minerals

- Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). (CCSSM.6.EE.4)
- Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. (CCSSM.7.RP.1)
- Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. (CCSSM.8.SP.1)

#### DID YOU KNOW?

##### **Growing food...**

The word “salary” was derived from the word “salt,” reflecting its importance in global trade. Global production of salt is about 250 million tons annually.

#### LESSONS IDEAS

Use the data on global salt production to compare the top producing countries, as well as the most popular methods for producing salt.

Petroleum comes from plants and animals over millions of years. Compare times to produce petroleum, availability and current rate of consumption. Analyze and chart the fuel required to produce food.

#### INFORMATION AND CURRICULUM

##### **Global Salt Production Data, Salt Institute**

[www.saltinstitute.org/content/download/14739/91891](http://www.saltinstitute.org/content/download/14739/91891)

##### **Cost Components of Domestically produced Food, DOE**

[www.afdc.energy.gov/data/tab/all/data\\_set/10341](http://www.afdc.energy.gov/data/tab/all/data_set/10341)

##### **Eating food...**

The suggested upper intake of salt is at 2,300 mg and the recommended intake is just 1,500 mg per day. Americans over the age of two consume on average about 3,400 mg of sodium daily.

What is the result of American’s high intake of salt? Have students compare the sodium content of foods they eat by either bringing in wrappers or looking up nutrient information in a database. Plot sodium content on graphs with labels to illustrate high salt food products.

Track nutrient intake for 2 days and plot mineral intake. How much sodium do your students eat compared to the recommendation?

##### **Americans Consume Too Much Sodium, CDC**

[www.cdc.gov/features/dssodium/](http://www.cdc.gov/features/dssodium/)

##### **SuperTracker, Analyze and Track your Diet and Exercise, Choose My Plate, USDA**

[www.choosemyplate.gov/supertracker-tools/supertracker.html](http://www.choosemyplate.gov/supertracker-tools/supertracker.html)

##### **Get What you Need, Compare What you Eat and Serving Sizes, Team Nutrition, USDA**

[http://teamnutrition.usda.gov/Resources/ne\\_get.pdf](http://teamnutrition.usda.gov/Resources/ne_get.pdf)

## Minerals

### Language Arts and Minerals

- Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. (CCSS.6.RL)
- Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. (CCSS.6.W)
- Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation. (CCSS.6.SL)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><b><i>Growing food...</i></b> The word “soil” or “dirt” in English is used in a positive way to describe the substance where we grow food; however, it has a negative connotation when we say “soiled” or “dirty.” Why does the Spanish language have different words for each?</p>	<p>Etymology is the study of words. Research information on the food system and pay attention to the use of different terms used to describe food and agriculture.</p>	<p><b><i>Teaching the Food System, Johns Hopkins University</i></b> <a href="http://www.jhsph.edu/research/centers-and-institutes/teaching-the-food-system/curriculum/">www.jhsph.edu/research/centers-and-institutes/teaching-the-food-system/curriculum/</a></p> <p><b><i>Historical Timeline, Farm Machinery, Growing a Nation</i></b> <a href="http://www.agclassroom.org/gan/timeline/farm_tech.htm">www.agclassroom.org/gan/timeline/farm_tech.htm</a></p>
<p><b><i>Eating food...</i></b> Some pregnant women crave and eat dirt! Geophagy is the act of eating earth or soil-like compounds such as dirt or clay and may be due to a craving for the high mineral content.</p> <p>Pregnant women’s bodies make more blood to support the growth of the fetus. Iron is an essential component in this process and iron deficiency anemia is common.</p>	<p>Research the pros and cons of using nutritional supplements for different reasons like during pregnancy, increase sports performance or prevent illness.</p> <p>Look at the 10 tips for reducing salt/sodium in the diet produced by MyPlate. Read the text and test for understanding. Have students create their own guide for the school.</p>	<p><b><i>MyPlate, Salt Guide, USDA</i></b> <a href="http://www.fns.usda.gov/cnd/healthierschoolday/pdf/19_TT_NE-SAS.pdf">www.fns.usda.gov/cnd/healthierschoolday/pdf/19_TT_NE-SAS.pdf</a></p> <p><b><i>Questions To Ask Before Taking Vitamin and Mineral Supplements</i></b> <a href="http://www.nutrition.gov/dietary-supplements/questions-ask-taking-vitamin-and-mineral-supplements">www.nutrition.gov/dietary-supplements/questions-ask-taking-vitamin-and-mineral-supplements</a></p> <p><b><i>Build a Healthy Plate with Less Salt and Sodium, USDA</i></b> <a href="http://www.fns.usda.gov/tn/Resources/nutritionandwellness/sodium.pdf">www.fns.usda.gov/tn/Resources/nutritionandwellness/sodium.pdf</a></p> <p><b><i>Just the Facts: Calcium, USDA</i></b> <a href="http://www.fns.usda.gov/tn/resources/jtf_milk.pdf">www.fns.usda.gov/tn/resources/jtf_milk.pdf</a></p>

## Vitamins

### At a Glance

#### Recommended Dietary Intake:

The Recommended Dietary Allowance indicates daily needs while the % Daily Value on food labels shows how much a given food contains

#### Calories per Gram of food: 0

Vitamins do not provide energy, but are essential compounds in the process of converting macronutrients into energy

#### Types of Vitamins:

Fat soluble - A, D, E, K

Water soluble - B (thiamin, riboflavin, niacin, folate, B6, B12, biotin, pantothenic acid), C

**Function:** Fat soluble: stored in fatty tissue until needed for essential roles like making proteins, chemical reactions and blood clotting. Water soluble: carried in watery substances and not stored; must be eaten daily; essential in energy metabolism, protecting cells and converting compounds

**Food Sources:** fruits, vegetables, whole grains, nuts, seeds, beans, meat, dairy

**Typical Serving size:** 1 orange has 103% of your daily vitamin C, 4% vitamin A, and B vitamins

**Health Concerns:** Severe deficiencies occur in developing countries, and in people with severe illnesses. Moderate deficiencies can occur from unhealthy diets in the U.S.

### Vitamins in the Body and Food

We eat food to deliver essential nutrients like vitamins to our bodies. Vitamins are tiny, non-caloric, organic compounds with very diverse functions related to growth, maintenance and repair of all cells. Each of the 13 vitamins is classified by a letter and has multiple functions. A vitamin can be either water-soluble or fat-soluble. This influences how they are absorbed by the body and carried where they are needed.

B vitamins are essential in the production of energy. They are found in abundance in whole grains, oranges, mushrooms, yogurt, seafood, nuts and beans. B12 is unusual because it is produced by bacteria, and found only in animal products. Vitamin K, essential to clot blood, is abundant in green leafy vegetables. Vitamin C has many functions, including fighting infection and assisting protein with chemical reactions. Our bodies can make vitamin D, required for healthy bones, from sunshine. Vitamins A, C and E act as antioxidants to help protect the body from compounds that can cause cancer or heart disease.



### Eating a Diet High in Vitamins

The best plan for maximizing intake of quality vitamins is to eat unprocessed or lightly processed foods. A diet high in fresh, canned or frozen fruits and vegetables will greatly increase your vitamin intake. Unfortunately, some of the most commonly consumed foods in the US are the least concentrated sources of vitamins due to heavy processing. For example, most of the wheat products we consume are made with white flour – a product of milling whole grain to remove the “germ” where most of the nutrients are.

While a potato is high in vitamin C and several B vitamins, potato chips and fries are not. Frying a potato not only adds a lot of fat but also destroys some of the heat sensitive vitamins.

While fruit juice can be healthier than soda, it is far less healthy than eating the whole fruit, containing fewer nutrients and more sugar. Choosing whole foods is always healthier than the products food processors make with them.

## Vitamins

### Selecting Healthy Food Using Food Labels

**Goal:** Learn how to use the Nutrition Facts label to select nutrient dense snacks.

**Exercise:** The Food and Drug Administration requires a Nutrition Facts panel on all packaged food products but not fresh produce which can be found on the internet. Compare the two labels below to assess the difference between a whole food snack and a candy snack. First compare the serving size of the strawberries, 1 cup, and the Twizzlers, 1 ounce. How many Twizzlers is that? (There are 4). Notice they both have sugar, so look at the ingredients list to determine whether it is “added” sugar or natural. Then look at the Daily Values and note the strawberries are an excellent source of vitamin C, while the Twizzlers have no vitamin C. Also important to note is that Twizzlers are not made with any real fruit, even though strawberries appear on the package. Instead they are made from mostly artificial flavors, chemicals and sugar. The comparison shows that the strawberries are nutrient dense and low calorie, whereas the candy is nutrient poor and high in calories (empty calories).

#### Strawberries

Nutrition Facts			
Serving Size 1 cup, halves 152g (152 g)			
Amount Per Serving			
Calories 49		Calories from Fat 4	
% Daily Value*			
Total Fat	0g		1%
Saturated Fat	0g		0%
Trans Fat			
Cholesterol	0mg		0%
Sodium	2mg		0%
Total Carbohydrate	12g		4%
Dietary Fiber	3g		12%
Sugars	7g		
Protein	1g		
Vitamin A	0%	Vitamin C	149%
Calcium	2%	Iron	3%

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

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

Calories per gram:  
Fat 9 • Carbohydrate 4 • Protein 4

©www.NutritionData.com

Ingredients: Strawberries



#### Strawberry Twizzlers

Nutrition Facts			
Serving Size 1 ounce 28g (1 ounce (28g))			
Amount Per Serving			
Calories 98		Calories from Fat 6	
% Daily Value*			
Total Fat	1g		1%
Saturated Fat	0g		0%
Trans Fat			
Cholesterol	0mg		0%
Sodium	80mg		3%
Total Carbohydrate	22g		7%
Dietary Fiber	0g		0%
Sugars	11g		
Protein	1g		
Vitamin A	0%	Vitamin C	0%
Calcium	0%	Iron	1%

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

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

Ingredients: Corn syrup; enriched wheat flour (flour, niacin, ferrous sulfate, thiamin mononitrate, riboflavin, and folic acid); sugar; cornstarch; contains 2% or less of: palm oil; salt; artificial flavor ; mono and diglycerides; citric acid; potassium sorbate (preservative); artificial color (red 40) ; mineral oil; soy lecithin; glycerin

## Vitamins

### History and Vitamins

- Identify key steps in a text's description of a process related to history/social studies. (CCSS.ELA-Literacy.RH.6-8.4)
- Describe how a text presents information (e.g., sequentially, comparatively, causally). (CCSS.ELA-Literacy.RH.6-8.5)
- Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies. (CCSS.ELA-Literacy.RH.6-8.4)

#### DID YOU KNOW?

##### **Growing food...**

Brown rice is a good source of vitamin B1, but white rice is not, as the vitamin is removed when the grain is polished. As a result, a deficiency disease called beri beri was common in Japan in the 1800s.

The carrots you eat have an agricultural history that dates back 5,000 years to Iran and Afghanistan and was purple.

##### **Eating food...**

The value of eating a certain food to maintain health was recognized long before vitamins were identified. The ancient Egyptians knew that feeding liver to a person would help cure night blindness, an illness now known to be caused by a vitamin A deficiency.

#### LESSONS IDEAS

What is the history of processing whole foods, i.e. making brown rice white and whole wheat flour white? What vitamins are removed in this process and what diseases have they contributed to in history? Have students watch the video on A Brief History of Processed Foods.

Trace the cultivation of the carrot across the globe and consider the historical evidence, agricultural practices and political influences.

One of the most important vitamins throughout history has been vitamin C. Deficiency was common among sailors, as access to fresh fruit was lacking. Research the history of this vitamin and its deficiency disease - scurvy.

Browse through some of the food history lesson plans

#### SUPPORTING INFORMATION AND CURRICULUM

***A Brief History of Processed Foods, Vimeo***  
<http://vimeo.com/40919343>

***Top 10 Vitamin Deficiencies, Listverse***  
<http://listverse.com/2012/03/16/top-10-vitamin-deficiencies/>

***World Carrot Museum***  
[www.carrotmuseum.co.uk/history.html](http://www.carrotmuseum.co.uk/history.html)

***The History of Scurvy, LoveToKnow Vitamins***  
[vitamins.lovetoknow.com/History\\_of\\_Scurvy\\_Vitamin\\_C](http://vitamins.lovetoknow.com/History_of_Scurvy_Vitamin_C)

***Food History Lesson Plans, Food Timeline***  
[www.foodtimeline.org/food2a.html](http://www.foodtimeline.org/food2a.html)

## Vitamins

### Science and Vitamins

- Cite specific textual evidence to support analysis of science and technical texts. (CCSS.ELA-Literacy.RST.6-8.1)
- Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. (CCSS.ELA-Literacy.RST.6-8.5)
- Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. (CCSS.ELA-Literacy.RST.6-8.6 )

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><b><i>Growing food...</i></b> Humans have developed the capability to add vitamins to our food products. However, in nature, animals, including humans, receive vitamins from their food. Concentrated sources include most fruits and vegetables and some animal products.</p>	<p>Discuss the role of vitamins in a natural ecosystem. Where do they originate? Plants produce many vitamins, and animals produce several as well. One vitamin, however, is only produced by bacteria – vitamin b12. Microbes in the soil produce this vitamin, as well as microbes in the guts of animals.</p>	<p><b><i>What’s In My Soil, USGS</i></b> <a href="http://education.usgs.gov/lessons/soil.pdf">education.usgs.gov/lessons/soil.pdf</a></p> <p><b><i>How is Vitamin C Added to Food, eHow</i></b> <a href="http://www.ehow.com/how-does_5006279_how-vitamin-c-added-food.html">www.ehow.com/how-does_5006279_how-vitamin-c-added-food.html</a></p>
<p><b><i>Eating food...</i></b> If we do not get enough vitamin B12 in our diets we can succumb to a condition known as B12 anemia.</p> <p>Scientists discovered the first vitamin (A) in 1913 and the last of the 13 known vitamins (B9, or Folate) in 1941. Of the 13, 9 are water soluble, and 4 are fat soluble.</p>	<p>What are some of the functions of vitamins in our bodies? What does vitamin B12 do in our bodies? What about vitamin C?</p> <p>Research various conditions of vitamin deficiency including good food sources of each vitamin.</p> <p>What does water soluble vs. fat soluble mean? Discuss water and oil mixing principles.</p>	<p><b><i>Vitamin Functions in the Body, WebMD</i></b> <a href="http://www.webmd.com/vitamins-and-supplements/vitamins-and-their-functions-and-sources">www.webmd.com/vitamins-and-supplements/vitamins-and-their-functions-and-sources</a></p> <p><b><i>Water vs. Fat Soluble Vitamins, WebMD</i></b> <a href="http://www.webmd.com/vitamins-and-supplements/nutrition-vitamins-11/fat-water-nutrient">www.webmd.com/vitamins-and-supplements/nutrition-vitamins-11/fat-water-nutrient</a></p> <p><b><i>The Nobel Prize and the Discovery of Vitamins</i></b> <a href="http://www.nobelprize.org/nobel_prizes/medicine/articles/carpenter/">www.nobelprize.org/nobel_prizes/medicine/articles/carpenter/</a></p>

# Vitamins

### Math and Vitamins

- Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). (CCSSM.6.EE.4)
- Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. (CCSSM.7.RP.1)
- Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. (CCSSM.8.SP.1)

#### DID YOU KNOW?

##### *Growing food...*

Global production of citrus fruits is about 105 million tons annually! 35 million tons of carrots are grown globally each year, 153 million tons of tomatoes, 145 million tons of bananas, and 102 million tons of sweet potatoes!

#### LESSONS IDEAS

Use the data on global fruit and vegetable production to calculate how many of a particular fruit or vegetable are produced. For example, if 105 million tons of oranges are produced, how many oranges is that? How many mg of vitamin C is that?

#### INFORMATION AND CURRICULUM

**Global Crop Production Data, GeoHive**  
[www.geohive.com/charts/ag\\_crops.aspx](http://www.geohive.com/charts/ag_crops.aspx)

**Great Algebra Sample Lesson, Algebra.com**  
[www.algebra.com/algebra/homework/word/unit\\_conversion/Unit\\_Conversion\\_Word\\_Problems.faq.question.157300.html](http://www.algebra.com/algebra/homework/word/unit_conversion/Unit_Conversion_Word_Problems.faq.question.157300.html)

##### *Eating food...*

Studies show that our prehistoric ancestors consumed 600mg of vitamin C, 11000 IU of vitamin A, and 33mg of vitamin E daily. The modern human diet provides only about 100mg of vitamin C, 4000 IU of vitamin A, and just 6mg of vitamin E. Human ancestors ate amazing quantities of whole plant foods, contributing to these differences.

Using the nutrition facts for various fruits and vegetables, have students calculate how many oranges they would need to eat to get 600mg of vitamin C; how many carrots to get 5500 micrograms of vitamin A; how many almonds to get 33mg of vitamin E.

##### **Nutrition Facts, Self.com, USDA**

Orange: [nutritiondata.self.com/facts/fruits-and-fruit-juices/1969/2](http://nutritiondata.self.com/facts/fruits-and-fruit-juices/1969/2)  
Carrots: [nutritiondata.self.com/facts/vegetables-and-vegetable-products/2383/2](http://nutritiondata.self.com/facts/vegetables-and-vegetable-products/2383/2)  
Almonds: [nutritiondata.self.com/facts/nut-and-seed-products/3170/2](http://nutritiondata.self.com/facts/nut-and-seed-products/3170/2)

## Vitamins

### Language Arts and Vitamins

- Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. (CCSS.6.RL)
- Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. (CCSS.6.W)
- Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation. (CCSS.6.SL)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><b><i>Growing food...</i></b> Food supply nutrient data influences what food is grown and how it is manufactured.</p>	<p>Consumers, researchers and public health professionals have influenced the food supply from focusing on food that is nutritionally adequate to food that maintains health and decreases risk of disease. What do farmers grow now that they didn't grow 30 years ago? How have food products changed?</p>	<p><b><i>Nutrient Content of the US Food supply</i></b> <a href="http://www.cnpp.usda.gov/publications/foodsupply/foodsupply1909-2000.pdf">www.cnpp.usda.gov/publications/foodsupply/foodsupply1909-2000.pdf</a></p>
<p><b><i>Eating food...</i></b> B vitamin folic acid (folate) naturally occurs in vegetables and grains. In 1998 the US required fortification of grain products with folate and their contribution to dietary folate rose from 30% to 60% in 2 years. (2000)</p>	<p>What is the difference between fortified and enriched on a food label? Explore why the US requires food companies to add nutrients to food products. What are the pros and cons?</p> <p>Provide the MyPlate poster to students in groups. Have them research restaurant meal photos and determine whether or not the meals meet the "half fruit and vegetable" requirement. Discuss the quality of food in restaurants/fast food chains.</p>	<p><b><i>Are foods that contain added nutrients considered "enriched"?</i></b> <a href="http://www.fda.gov/AboutFDA/Transparency/Basics/ucm194348.htm">http://www.fda.gov/AboutFDA/Transparency/Basics/ucm194348.htm</a></p> <p><b><i>MyPlate Half Fruits and Veggies Poster, USDA</i></b> <a href="http://teamnutrition.usda.gov/Resources/myplate_halfplateposter.pdf">teamnutrition.usda.gov/Resources/myplate_halfplateposter.pdf</a></p> <p><b><i>MyPyramid Amounts of Foods—FOR YOU, USDA</i></b> <a href="http://teamnutrition.usda.gov/Resources/ne_amounts4u.pdf">teamnutrition.usda.gov/Resources/ne_amounts4u.pdf</a></p> <p><b><i>Great Vocabulary List, Team Nutrition, USDA</i></b> <a href="http://teamnutrition.usda.gov/Resources/ne_vocab.pdf">teamnutrition.usda.gov/Resources/ne_vocab.pdf</a></p>

## Water

### At a Glance

**Recommended Dietary Intake:**

Six to eight 8oz glasses a day

**Calories per Gram of Food: 0**

Water contains no calories

**Types of Water:**

- Distilled Water
- Carbonated Water
- Filtered Water
- Mineral Water
- Spring Water
- Public Water (Tap)

**Function:** Water is the most important nutrient in our body, as it delivers all other nutrients to the cells. Our bodies are made up of 60% water – the brain is 80% water. Water helps cleanse the body.

**Food Sources:** Drinking water, juices, teas, fruits and vegetables

**Typical Serving size:** 1 cup of water, or 8 ounces

**Health Concerns:** Dehydration can lead to major health problems in the body. In the short term, low energy and fatigue are common. Severe dehydration leads to pale skin, rapid breathing, and thickening of blood. Chronic dehydration can contribute to cancers of the bladder and colon, heart attack, kidney stones and more.

### Water in Food and the Body

Water is essential to all life and provides a medium for physical and chemical reactions, transportation of nutrients and waste, and temperature regulation. Water is distributed throughout the body in different levels of concentration. For example, muscle is 75% water while bone is 25% water. Staying hydrated by drinking fluids is vital. There is no substitute for drinking pure water, though some other beverages like tea, fruit juice, milk, and soymilk or coconut water can hydrate the body.

Food also contributes water to the body. Fruits and vegetables have very high water content. For example, spinach is 92% water, carrots 87% water, apples 84%, watermelon 92%, and tomatoes are 94% water, and they come loaded with vitamins, minerals, and fiber. Eat these foods in abundance.



### Factors that Influence Hydration

There are many factors that influence a person’s hydration level. In terms of intake, since the body cannot store water or make enough, we need to supply 80% of daily water needs with fluids. On average, 13 cups for men and 9 cups for women with the additional 20% coming from food. Soda and sports drinks have become the largest suppliers of fluids, but their high sugar and caffeine content adds calories without nutrients.

In terms of output, water is lost mostly through urine and evaporation from lungs and skin. The environmental temperature, humidity, body size and intensity of physical activity greatly influence the rate of sweating and evaporation, and the need to replace the lost water. In addition, direct sunlight, caffeine and salty food influence the water balance in your body. While salt is an incredibly important mineral in determining movement of water into and out of cells, consuming too much, as most Americans do, increases the need for water to help us flush the excess salt out. The brain and kidneys regulate water balance.

### Selecting Healthy Food Using Food Labels

**Goal:** Understand the importance of being an educated consumer of drinking water.

**Objective:** Analyze the difference in quality and price of bottled versus tap water. Drinking water is regulated, as is food, by government agencies. The Environmental Protection Agency (EPA) regulates public tap water while the Food and Drug Administration (FDA) regulates bottled water. The EPA sets standards for 90 contaminants in public drinking water and enforces compliance making the public water safe and monitored by state, local and consumer groups. The FDA adopts the same standards for contaminants in bottled water; however, monitoring is limited. In addition, there are no labeling laws that define the source of water. A bottler can claim the water is “artesian” or “spring” water even when it comes from a municipal source. Don’t be fooled into paying extra for bottled water that may not be healthier for you. Find out whether your state monitors and inspects bottling plants, where the source of water is coming from and where the empty bottles end up.

**International Bottled Water Association**

<http://www.bottledwater.org/> and [www.bottledwater.org/newsroom/policy-statement/labeling](http://www.bottledwater.org/newsroom/policy-statement/labeling)

**Ask the Regulators, Bottled Water Regulation and the FDA**

<http://www.fda.gov/downloads/Food/FoodborneIllnessContaminants/BuyStoreServeSafeFood/ucm077094.pdf>

**Drinking Water Standards & Risk Management, EPA**

<http://water.epa.gov/drink/standardsriskmanagement.cfm>

Naturally Occurring Healthy Ingredients in Water	Sample of Monitored Contaminants in Water
Calcium	<b>Inorganic Chemicals</b>
Magnesium	Arsenic, mercury, copper
Potassium	Fluoride, lead , cyanide
Sodium	<b>Organic Chemicals (including pesticides)</b>
Fluoride (added to prevent cavities)	Benzene, Simazine, Styrene, Dioxin, Dichloromethane
	<b>Microorganisms</b>
	Giardia lamblia
	Legionella
	<b>Disinfectants</b>
	Bromate
	Chlorine
	<b>Radioactive Materials</b>
	Radium
	Uranium

## Water

### History and Water

- Identify key steps in a text’s description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered). (CCSS.ELA-Literacy.RH.6-8.4)
- Describe how a text presents information (e.g., sequentially, comparatively, causally). (CCSS.ELA-Literacy.RH.6-8.5)
- Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies. (CCSS.ELA-Literacy.RH.6-8.4)

#### DID YOU KNOW?

##### ***Growing food...***

Droughts have played a very important role in shaping human history. In fact, they are so important to human history that they are some of the first ever recorded climatic events, and are even thought to have sparked human migration out of Africa 135,000 years ago!

##### ***Eating food...***

Water is of supreme importance to agriculture, and drought affects the ability of farmers to produce enough food. Likewise, drought leads to potential dehydration in humans, especially throughout history.

#### LESSONS IDEAS

What is the history of drought and how has it affected human history? Have students research a specific drought period in history and discuss the impacts on agriculture.

Discuss various cultures around the world and compare and contrast the history of drought.

Local watersheds help shape human history. A great way to connect students to this history is to examine the Chesapeake Bay watershed. Have the students research this history and discuss the various reasons why local watersheds are so important.

#### INFORMATION AND CURRICULUM

***History of North American Drought, NOAA***  
[www.ncdc.noaa.gov/paleo/drought/drght\\_history.html](http://www.ncdc.noaa.gov/paleo/drought/drght_history.html)

***The Drought of 2012 Lesson, PBS.org***  
[www.pbs.org/newshour/thenews/materials/Drought2012.SSLessonPlan.pdf](http://www.pbs.org/newshour/thenews/materials/Drought2012.SSLessonPlan.pdf)

***Mapping a Watershed History, Longwood***  
[www.longwood.edu/cleanva/images/Sec7.mapwatershed.pdf](http://www.longwood.edu/cleanva/images/Sec7.mapwatershed.pdf)

***Learn the Issues, Chesapeake Bay Program***  
[www.chesapeakebay.net/issues](http://www.chesapeakebay.net/issues)

## Water

### Science and Water

- Cite specific textual evidence to support analysis of science and technical texts. (CCSS.ELA-Literacy.RST.6-8.1)
- Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. (CCSS.ELA-Literacy.RST.6-8.5)
- Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. (CCSS.ELA-Literacy.RST.6-8.6 )

#### DID YOU KNOW?

##### **Growing food...**

While soil, sun, and feed crops are all important to agriculture, none of it is possible without water. Water is the largest input on farms. Crops need plentiful water, and animals all need water to grow.

##### **Eating food...**

Not consuming enough water leads to dehydration, and while the effects of extreme dehydration are well known, less known is chronic dehydration. Unfortunately, most Americans live in this state, and over time, your body becomes less sensitive to thirst signals.

Water makes up about 83% of the volume of your blood, making dehydration all the more serious.

#### LESSONS IDEAS

Water is very important to biological systems and the earth. Our bodies are about 57% water. The earth is covered by 70% water, 96.5% of which is contained in the oceans. Of the remaining fresh water, most of it is stored in glaciers. Just a very small percentage is actually usable by humans.

Watch the NFL video on the importance of drinking water and staying hydrated.

Have students research the ecology of the Chesapeake Bay Watershed, and write reports on the importance of keeping it clean.

#### INFORMATION AND CURRICULUM

**Global Warming/Drought, Wunderground**  
[www.wunderground.com/earth-day/2013/increased\\_risk\\_of\\_drought\\_under\\_global\\_warming](http://www.wunderground.com/earth-day/2013/increased_risk_of_drought_under_global_warming)

**Water on Earth’s Surface, USGS**  
[ga.water.usgs.gov/edu/earthwherewater.html](http://ga.water.usgs.gov/edu/earthwherewater.html)

**NFL Science Video on Water, NFL**  
[www.nbclearn.com/nfl/cuecard/50683](http://www.nbclearn.com/nfl/cuecard/50683)

**Chesapeake Bay Program**  
[www.chesapeakebay.net/discover/baywatershed](http://www.chesapeakebay.net/discover/baywatershed)

**Watersheds, Bridge Ocean Education Center**  
[www2.vims.edu/bridge/DATA.cfm?Bridge\\_Location=archive0203.html](http://www2.vims.edu/bridge/DATA.cfm?Bridge_Location=archive0203.html)

**Eyes on the Bay, MD DNR**  
[mddnr.chesapeakebay.net/eyesonthebay/lesson\\_plans.cfm](http://mddnr.chesapeakebay.net/eyesonthebay/lesson_plans.cfm)

## Water

### Math and Water

- Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). (CCSSM.6.EE.4)
- Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. (CCSSM.7.RP.1) Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. (CCSSM.8.SP.1)

#### DID YOU KNOW?

#### LESSONS IDEAS

#### INFORMATION AND CURRICULUM

#### *Growing food...*

An astonishing 50 billion bottles of water are produced each year just in the United States! That averages to 1,500 bottles consumed each second. Bottled water is 1,000 times more expensive than tap water. 2 liters of tap water a day costs just 50 cents for the entire year!

Using the price difference between bottled water and tap water, have the students calculate the annual cost of drinking 2 liters per day of bottled water and compare that to tap water

***Bottled Water Production Data, TreeHugger***  
[www.treehugger.com/clean-water/the-us-consumes-1500-plastic-water-bottles-every-second-a-fact-by-watershed.html](http://www.treehugger.com/clean-water/the-us-consumes-1500-plastic-water-bottles-every-second-a-fact-by-watershed.html)

***Great Algebra Sample Lesson, Algebra.com***  
[www.algebra.com/algebra/homework/word/unit\\_conversion/Unit\\_Conversion\\_Word\\_Problems.faq.question.157300.html](http://www.algebra.com/algebra/homework/word/unit_conversion/Unit_Conversion_Word_Problems.faq.question.157300.html)

#### *Eating food...*

Believe it or not, humans are supposed to drink about 182.5 gallons of water each year. This is based on the recommended 64 ounces a day, or eight 8 oz glasses. However, Americans do not drink the recommended amount. In fact, the average American drinks 44 gallons of soda a year and just 58 gallons of water, less than 1/3 the recommendation.

Have the students record how much water they drink each day for a week, then graph the student's numbers. Compare this to the recommended amount and discuss ways to drink more water and less soda.

Use CDC data on sugar drink consumption and analyze.

***Interactive Math Lesson on Water, TV411***  
[www.tv411.org/science/tv411-whats-cooking/water-math-lesson](http://www.tv411.org/science/tv411-whats-cooking/water-math-lesson)

***Consumption of Sugar Drinks in US - Data, CDC***  
[www.cdc.gov/nchs/data/databriefs/db71.htm](http://www.cdc.gov/nchs/data/databriefs/db71.htm)

## Water

### Language Arts and Water

- Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. (CCSS.6.RL)
- Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. (CCSS.6.W)
- Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation. (CCSS.6.SL)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><b><i>Growing food...</i></b> Water is precious to life and is thus celebrated through many art forms around the world. Many people in other countries struggle with access to this precious necessity – some 2.6 billion living in a water insecure place.</p>	<p>Have students pick their favorite poem about water and read it aloud to the class. Then have students create their own poems about water.</p> <p>Complete the Global Water Crisis mini unit and discuss water issues around the globe.</p>	<p><b><i>Collection of Poems About Water, PoemHunter</i></b> <a href="http://www.poemhunter.com/poems/water/">www.poemhunter.com/poems/water/</a></p> <p><b><i>Global Water Crisis Mini Unit, Water.org</i></b> <a href="http://static.water.org/docs/curriculums/WaterOrg%20MidCurric8.pdf">static.water.org/docs/curriculums/WaterOrg%20MidCurric8.pdf</a></p>
<p><b><i>Eating food...</i></b> Staying hydrated is one of the most important things a child can do to stay healthy. This is a priority for both the Team Nutrition and the Let's Move Campaigns. Especially important is choosing water over sugared beverages, like soda or juice with added sugar.</p>	<p>Have students read the opening page to this document as a complex text. Test their understanding and review concepts and vocabulary words.</p> <p>Provide the “Make Water Available” poster to students. Have them read and discuss key points. Then have them pick a day of the week to focus on drinking water, and create materials to distribute throughout the school promoting this day.</p>	<p><b><i>Make Water Available Poster, Team Nutrition/USDA</i></b> <a href="http://www.fns.usda.gov/tn/Resources/nutritionandwellness/water.pdf">www.fns.usda.gov/tn/Resources/nutritionandwellness/water.pdf</a></p> <p><b><i>5 Simple Steps to Success, Let's Move Campaign</i></b> <a href="http://www.letsmove.gov/sites/letsmove.gov/files/pdfs/TAKE_ACTION_KIDS.pdf">www.letsmove.gov/sites/letsmove.gov/files/pdfs/TAKE_ACTION_KIDS.pdf</a></p>



# Integrating Nutrition Into Core Subjects

## Lesson Record



Date \_\_\_\_\_ School \_\_\_\_\_

Name \_\_\_\_\_ Email \_\_\_\_\_

Grade \_\_\_\_\_ No. of Students \_\_\_\_\_

**Directions:** Use this form to keep track of the lessons you taught on nutrition, food, gardening or physical activity.

Core Subject
Name of Lesson
Learning Standard Addressed
Objective of Lesson
Activities
Outcomes
Comments

## Tracking Your Efforts

### Nutrition Theme of the Week/Month

Week Day	M	T	W	Th	F
<b>Nutrition Goal 1:</b> Integrate nutrition into at least <b>2</b> lessons per week. Track your lessons by initialing days.					
<b>Nutrition Goal 2:</b> Schools must provide 75 minutes per week of health education for students K-8					
<b>Physical Education Goal 1:</b> Provide at least <b>2</b> lessons per week, and at least <b>10</b> minutes per day of activity.					
<b>Physical Education Goal 2:</b> Schools must provide 225 minutes per week of physical education, with half in the form of physical activity					

### Ideas for Physical Activity Breaks

**Brain Breaks** - <http://www.emc.cmich.edu/brainbreaks/TOC.htm>

**“Eat Smart, Move More” Energizers for Middle Schools** -

<http://www.eatsmartmovemorenc.com/Energizers/Middle.html>

**Dance Breaks** - Use music often; transition breaks; dancing; music during lunch; intercom activities; weekly or monthly dance parties as reward system; use somebody new, interesting, “cool” to come in and dance with the kids; e.g. Cha-Cha-Slide

**Beyonce “Move Your Body”** - [http://www.youtube.com/watch?v=wc\\_PizWNp6k](http://www.youtube.com/watch?v=wc_PizWNp6k)

**Standing/Stretching Breaks** – Have kids stand up, do stretches. Lean to your left, and then your right, touch your toes, hands reaching to the sky, roll your neck, etc. Could put on soothing music or energetic music and make it more dance-like

**Jammin’ Minutes!** – These videos are awesome, 55 of them in the playlist:

<http://www.youtube.com/playlist?list=PL9CC7E232FA1A90CD>

**Three-Minute Brain Breaks** - <http://www.minds-in-bloom.com/2012/04/20-three-minute-brain-breaks.html>

# School Gardens

School gardens are a great way to encourage healthy habits for the students, teachers, and staff of your school. Not only do school gardens offer an exciting place to learn, but it engages the entire school community in conversation around school food, nutrition education and physical activity. Here are just a few benefits of a school garden:

## ***Educational Benefits***

Gardening offers hands-on, experiential learning opportunities in a wide array of disciplines, including the natural and social sciences, math, language arts, visual arts, and health. There is mounting evidence that students who participate in school gardening score significantly higher on standardized science achievement tests (Klemmer, et.al. 2005).

## ***Environmental Stewardship and Connection with Nature***

When children learn about water and energy cycles, the food chain, and the peculiar needs of individual species, and when they feel a sense of connection to a certain species or individual plant, they have a reason to care about all the forces that impact that plant's future. A garden offers many occasions for achieving insight into the long-term human impact on the natural environment.

## ***Lifestyle and Nutrition***

School gardening provides children opportunities for outdoor exercise while teaching them a useful skill. Gardens containing fruit and vegetables can also help to revise attitudes about particular foods. There is mounting evidence that learning in gardens is more likely to transform children's food attitudes and habits, and that school gardening, especially when combined with a healthy lunch program or nutritional education, encourages more healthful food choices. When students take their preferences back to their families, they can help to improve family consumption choices.

## ***Active Learning and Student Engagement***

Gardening activities can help engage students who are experiential learners and who have abundant energy. Hands on activities and tangible outcomes can be very rewarding and reinforcing.

## ***Teachers as Gardeners***

Teachers also learn useful gardening skills and benefit from the fresh air and exercise when they incorporate gardening into their lesson plans. For those with limited experience, many school districts and local organizations offer free training. These skills can be transferred to their own homes and social networks, thereby benefiting their personal community.

## ***Connection to History and the Community***

Gardening can tie students to social, cultural and material history of the land. Learn from local gardeners about traditional gardening techniques and native plants. Connect to local history. Study student heritage through the garden.

# School Gardens

## *School pride*

Like a team sport or mascot, a garden can offer a symbolic locus of school pride and spirit. A garden offers schools a way of helping children to identify with their school and to feel proud of their own individual contribution. Children know which plants they helped to grow, and they feel proud of them. This can improve school spirit, children's attitudes toward the school and be a visual sign of school creativity and nurturing.

## **Resources**

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### *How to Start a School Garden*

#### **How to Start a School Garden: A Toolkit**

A comprehensive toolkit for teachers creating a school garden. Offers background information about school gardens and their benefits. In addition, moves from planning, to inception, to activities involving the school garden. Also offers a list of resources for curriculum and activities around gardening.

[www.healthiergeneration.org/uploadedFiles/For\\_Schools/1\\_SnacksMeals/GardenTK.pdf](http://www.healthiergeneration.org/uploadedFiles/For_Schools/1_SnacksMeals/GardenTK.pdf)

#### **How to Start a School Garden**

A very basic guide to organizing a school garden including: site design, and materials. Also offers information about fundraising for the garden and how to engage students from inception.

[www.eecom.net/mfsp/projects\\_school\\_garden.pdf](http://www.eecom.net/mfsp/projects_school_garden.pdf)

#### **KidsGardening: Helping Young Minds Grow**

A comprehensive database of various topics in child gardening as a whole. One section devoted to school gardening specifically that address what the benefits of school gardens are, how to gain support for them, and how to mobilize efforts at schools. In addition, there is a list of available grant and fundraising opportunities for school gardens.

[www.kidsgardening.org/](http://www.kidsgardening.org/)

**My Healthy School: Five Steps to Starting a School Garden** - Five easy steps to follow when creating a school garden from planning to conception and maintenance.

[www.myhealthyschool.com/gardens/starting.php](http://www.myhealthyschool.com/gardens/starting.php)

#### **Getting Started: A Guide to Creating School Gardens as Outdoor Classrooms**

A fifty page look at what a garden is, what a school garden is, how it is created, and how it is maintained. Then, looks more closely at how to use this garden as an outdoor classroom and engage students in creative activities around the garden. Lastly, uses examples from schools around the country about experiences with school gardens.

[www.ecoliteracy.org/downloads/getting-started](http://www.ecoliteracy.org/downloads/getting-started)

# School Gardens

## Checklists

**Starting a School Garden** - An extensive checklist for designing, creating, and implementing a school garden.  
[www.suppersforsobriety.org/Documents/Garden/SchoolGardenChecklist.pdf](http://www.suppersforsobriety.org/Documents/Garden/SchoolGardenChecklist.pdf)

**Starting a School Garden** - A quick checklist for steps in planning a school garden.  
<http://oconto.uwex.edu/files/2010/08/Starting-A-School-Garden.pdf>

## Databases

A database of guides for each step in creating a school garden: make the case, plan for success, create the garden, learn in the garden, and keep it growing. Offers downloadable guides in each subject with easy to understand activity and lesson plans.

[www.schoolgardenwizard.org/](http://www.schoolgardenwizard.org/)

**The California School Garden Network** – One of the leading school garden programs in the country. A website filled with resources on every topic in school gardens including problem solving, safety, and maintenance. It also offers an extensive network of schools with gardens to collaborate with.

[www.csgn.org/create](http://www.csgn.org/create)

