BIG IDEAS

Linking Food, Culture, Health, and the Environment

A New Alignment with Academic Standards

Center for Ecoliteracy in Partnership with National Geographic

Grades K–12

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Center for Ecoliteracy
David Brower Center
2150 Allston Way, Suite 270
Berkeley, CA 94704-1377

For more information about this publication, email info@ecoliteracy.org or visit www.ecoliteracy.org.

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BIG IDEAS

Linking Food, Culture, Health, and the Environment
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Most people engage in the act of eating every day. What we eat and how we grow, process, prepare, and consume food profoundly affect the lives and welfare of humans and other beings, yet our food systems remain a mystery to many people. It is vital that we all understand the linkages between the *food* we eat, the ways that *culture* shapes our food choices and behaviors, the relationship between food and our *health*, and the interconnections between our food systems and the *environment*.

Fostering this understanding should have an important place in our schools. To facilitate incorporating these themes, this publication identifies key "big ideas" that link food, culture, health, and the environment and demonstrates how they align with the following new academic standards:

- Common Core State Standards
- Next Generation Science Standards: Crosscutting Concepts
- College, Career, and Civic Life Standards for Social Studies (also known as C3)
- National Health Education Standards
- California Nutrition Competencies (from *Nutrition Education Resource Guide for California Public Schools, Kindergarten Through Grade Twelve*)

An earlier iteration, *Big Ideas: Linking Food, Culture, Health, and the Environment* (2008), provided an extensive conceptual road map based on benchmarks established by the American Association for the Advancement of Science. The present publication offers samples of learning opportunities that engage students simultaneously with relevant big ideas and current academic standards.

This edition of *Big Ideas* was prepared to coincide with the launch of *National Geographic's* 2014 landmark series of magazine articles, "The Future of Food." This series traces the development of our dominant food systems and associated societal issues. It profiles promising strategies for creating systems for nourishing ourselves that better serve people, communities, and the natural environment.

We hope that *Big Ideas* will be a valuable resource as you help students make their own connections between food, culture, health, and the environment.

CENTER FOR ECOLITERACY

NATIONAL GEOGRAPHIC

CONTENTS

K-2

FOOD

Producing Food: Overview

Food is essential for our survival. Yet most people never see food before it gets to the grocery store, and primary-aged children may have only vague ideas about where their food comes from. Learning about food sources and origins is an important step in exploring the impacts of our food choices on society and the environment.

Big Idea

The food we eat comes from plants or animals, most of which are raised on farms or in gardens.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Cause and Effect	Take a walk in the schoolyard or garden to look for plants that are being eaten by animals. You could also read a story such as Beatrix Potter's *The Tale of Peter Rabbit*. Discuss the possible effect that animals eating plants has on plants and people and explore ways to protect plants so that people can eat them.
Systems and System Models	Read a book about the journey of food from farm to plate, such as *From Cow to Ice Cream* by Bertram T. Knight. Illustrate the similar journey of one food item served in the lunchroom.
Energy and Matter	Practice using a variety of garden tools—for example, trowels, shovels, hoes, and rakes. Talk about how tools and machines help people grow food by requiring less work (energy). (This also relates to Standard K-2 ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.)

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Reading Literature	Read *From Wheat to Bread* by Kristin Thoennes Keller. Draw a simple illustration to show the steps involved in growing, harvesting, processing, and transforming wheat into bread. (RI.K.1. With prompting and support, ask and answer questions about key details in a text. RI.1.1. Ask and answer questions about key details in a text. RI.2.3. Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.)
Writing	Watch plants grow from seed to edible mature plants (for example, by growing radish, leaf lettuce, or bean seeds in the school garden or in paper cups in the classroom). Write and illustrate stories about caring for garden plants. (W.K.3. Use a combination of drawing, dictating, and writing to narrate a single event or several loosely linked events, tell about the events in the order in which they occurred, and provide a reaction to what happened. W.1.3. Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure. W.2.3. Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Applying Disciplinary Concepts and Tools—Economics	Make applesauce from apples, strawberry jam from strawberries, or prepare other foods from plants or plant parts. (D2.Eco.3.K-2. Describe the skills and knowledge required to produce certain goods and services.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
1. Essential Nutrition Concepts	Make a class chart of "Basic Needs." Under the headings "People," "Other Animals," and "Plants," identify the basic needs that must be met for each category of living beings to survive. (1h. Consider the interactions among nutrition science, ecosystems, agriculture, and social systems that affect health, including local, national, and global perspectives. [For Kindergarten: Describe what plants and animals need for growth.])

CULTURE

Understanding Behavior: Overview

Food is much more than just nourishment. It is also a reflection of our individual tastes, as well as of our culture, traditions, and life situations. By identifying their own food choices and eating habits and those of people around them, students can begin to recognize factors involved in making healthful food choices.

Big Idea

People have different tastes in food.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Patterns	Read a story about foods from other cultures, such as *Everybody Cooks Rice* by Norah Dooley, in which a young boy eats rice prepared by neighbors from different ethnic backgrounds. Sketch the variety of foods portrayed in the story.

Common Core State Standards—Mathematics

DOMAIN	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Measurement and Data	Select six favorite fruits and create a graph showing the number of students in the class who prefer each fruit. Make similar graphs for vegetables, grains, meats, and beans. Invite your school's food service director to talk about how this information can be used to plan school lunches. (1.MD.4. Organize, represent, and interpret data with up to three categories. 2.MD.10. Draw a picture graph and a bar graph to represent a data set with up to four categories.)

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Reading Literature	Read and discuss a story that deals with various food customs, such as *How My Parents Learned to Eat* by Ina R. Friedman or *Yoko* by Rosemary Wells. How are people's food customs alike, and how do they differ? (RL.K.7. With prompting and support, describe the relationship between illustrations and the story in which they appear [e.g., what moment in a story an illustration depicts]. RL.1.7. Use illustrations and details in a story to describe its characters, setting, or events. RL.2.7. Use information gained from the illustrations and words in a print or digital text to demonstrate understanding of its characters, setting, or plot.)
Writing	Imagine the perfect meal for breakfast, lunch, or dinner. Think what you would most like for a birthday or another special day. On a paper plate, draw a picture of the meal and, on another piece of paper, write explanatory text describing it. (W.K.2. Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. W.1.2. Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. W.2.2. Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.)

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Writing	Create a class cookbook of favorite family recipes and include a short story about where each recipe came from, why it's a family favorite, or special occasions associated with the recipe. Discuss ways people learn from others about what and how to cook. (W.K.1. Use a combination of drawing, dictating, and writing to narrate a single event or several loosely linked events, tell about the events in the order in which they occurred, and provide a reaction to what happened. W.1.3. Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure. W.2.3. Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Applying Disciplinary Concepts and Tools—Geography	Read *Gai See: What You See in Chinatown* by Roseanne Thong. Discuss the exotic, local, and seasonal items found at a Chinese street market. (D2.Geo.5.K-2. Describe how human activities affect the cultural and environmental characteristics of places or regions.)
Applying Disciplinary Concepts and Tools—Geography	Try foods from other countries brought in by parents or other community members, perhaps focusing on one food category such as grain products, with samples of roti, pita, rice, couscous, tortillas, and so on. (D2.Geo.11.K-2. Explain how the consumption of products connects people to distant places.)

National Health Education Standards

[Not applicable]

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
2. Analyzing Nutrition Influences	Post items on a class bulletin board regarding rituals and rules (such as words of thanks, washing hands before eating, or special foods for holidays) that families have for meals and food. (2. All students will demonstrate the ability to analyze internal and external factors influencing food choices and health outcomes. For Kindergarten: Give one example of a favorite food custom or food choice on a special holiday. For Kindergarten: Identify one practice that makes meal-times enjoyable.)

HEALTH

Maintaining Health: Overview

As a species, humans are quite curious about themselves. For young students, this innate curiosity includes questions about their own bodies and what they need in order to move and function. By building on this curiosity, students can explore the concept that certain foods are good for a healthy body as they start to consider the relationships among food, movement, and health.

Big Idea

What we eat and the way we use our bodies can affect our health.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Stability and Change	Plant radish, cherry tomato, cucumber, or sugar snap pea seeds in the garden or in pots. Water and watch the vegetables grow and harvest them when they are ripe. What changes do the seeds reveal? Then experience the tastiness of fresh, healthful garden-grown vegetables.

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Reading Informational Text	Read a book on the topic of healthful eating, such as *Gregory, the Terrible Eater* by Mitchell Sharmat or *Eating the Alphabet* by Lois Ehlert. Make a list of healthful foods. (RI.K.1. With prompting and support, identify the main topic and retell key details of a text. RI.1.1. Ask and answer questions about key details in a text. R.2.1. Ask and answer such questions as *who*, *what*, *where*, *when, why*, and *how* to demonstrate understanding of key details in a text.)

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Writing	Draw pictures of a healthy person and then brainstorm words to describe someone who is healthy. (W.K.2. Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. W.1.2. Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. W.2.2. Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Applying Disciplinary Concepts and Tools—Economics	Compile a recipe box of healthful snacks that children can prepare themselves, such as carrot sticks and peanut butter. Copy recipes to prepare at home. (D2.Eco.3.K-2. Describe the skills and knowledge required to produce certain goods and services.)

National Health Education Standards

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Standard 1. Essential Health Concepts	Keep a simple diary of food and physical exercise for a given day. Make a class list of fruits, vegetables, and other healthful foods, as well as the different kinds of exercise included in the diaries. (1.2.1. Identify that healthy behaviors impact personal health.)
Standard 7. Practicing Health-Enhancing Behaviors	Write a story or draw pictures of things that people should avoid putting in their bodies. (7.2.2. Demonstrate behaviors that avoid or reduce health risks.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
1. Essential Nutrition Concepts	Make a class chart of food groups, with the headings “Fruits,” “Vegetables,” “Milk,” “Grains,” and “Meat/Beans.” Cut out pictures of food from magazines and tape them underneath the appropriate headings. Find food items from the school lunch menu that fit into each category. (1b. Know nutrition and health guidelines. For Grades 1-2: 1.1.N. Classify various foods into appropriate food groups.)
7. Practicing Nutrition-Enhancing Behaviors	Explore balanced meals that include foods from various food groups. Use pictures of food from magazines to create examples of different meals. Which ones are balanced and healthy? What could we do to make an unhealthy meal healthier? (7. All students will demonstrate the ability to practice nutrition-related behaviors that reduce risk and promote health. For Grades 1-2: Plan a nutritious meal.)

ENVIRONMENT

Sustaining Life: Overview

Why do people eat? Like all living things, we need food to stay alive. All animals—including people—take in plants or other animals for food. Plants, on the other hand, are able to create their own food using sunlight. By exploring this basic need for food, students can begin to see how their food connects them to other living things and to their environment.

Big Idea

Living things need some kind of food to live.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Cause and Effect	Explore how sunlight affects plants: place marigold or zinnia seeds in small pots or egg cartons; put some pots next to a sunny window and others in the dark. Compare the plants' growth and appearance. Afterward, transplant them in the garden to provide nectar for butterflies and seeds for finches and sparrows. (This also directly relates to standard 2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow.)
Systems and System Models	Make paper chains representing simple food chains to show that plants need sunlight to grow, some animals eat plants, and other animals eat animals (for example, Sun → Grass → Cow → Person)
Energy and Matter	Explore the notion that all living things need energy by looking for evidence—such as chewed leaves or fruits, nipped stems, or slimy snail trails—that animals live and eat in the garden or schoolyard.

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Reading Informational Text	Read a picture book describing food webs, such as *The Magic School Bus Gets Eaten: A Book About Food Chains* by Patricia Relf and Carolyn Bracken or *Who Eats What? Food Chains and Food Webs* by Patricia Lauber. Discuss the key points in the book. (RI.K.1. With prompting and support, ask and answer questions about key details in a text. RI.1.1. Ask and answer questions about key details in a text.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
Applying Disciplinary Concepts and Tools—Geography	Make simple bird feeders by spreading pinecones with peanut butter or suet and rolling them in birdseed. Place the feeders outside the class window and see what kinds of birds they attract. What else can people do to help birds and other wildlife? (D2.Geo.5.K-2. Describe how human activities affect the cultural and environmental characteristics of places or regions.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES K–2
1. Essential Nutrition Concepts	Looking at pictures of a variety of foods, identify their original sources. For example, jelly comes from fruits, cheese from cows, and bread from wheat. Which sources are animals and which are plants? Is there any source that is neither animal nor plant? (1a. Know the six nutrient groups and their functions. For Kindergarten: Identify the variety of foods of plant origin. Identify the variety of foods of animal origin, such as eggs, fish, poultry, beef, and milk.)

3-5

FOOD

Producing Food: Overview

Most of the plants and animals we eat are grown or raised on a farm. Once a fairly simple process, getting food from the farm to the consumer now involves a complex system that includes many different jobs, complex processes, and resources. Learning about the people and the effort necessary to bring food to the table is essential for understanding the impacts of our food choices.

Big Idea

To produce food for our society, people need to plant, grow, harvest, transport, and process crops, and raise animals for eggs, milk, and meat.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Cause and Effect	Conduct a taste test of fresh, canned, and frozen foods to explore what causes differences in appearance, quality, and flavor. What effect does the process of preserving food have on food? What are the advantages and disadvantages of preserving food? (This also involves "Scientific and Engineering Practice: Planning and Carrying Out Investigations.")
Systems and System Models	Identify the parts and flows of two food systems—the industrial food system and a local food system. Then create infographics illustrating the two systems. (This also involves "Scientific and Engineering Practice: Developing and Using Models.")
Energy and Matter	Grow edible plants and diagram the flow of energy in a garden. Include primary producers, primary and secondary consumers, and decomposers. (This also involves "Scientific and Engineering Practice: Developing and Using Models.")

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Reading Informational Text	Read oral histories from "Traditional Foodways of Native America" on the Cultural Conservancy website at http://www.nativeland.org/foodways_prog.html. These oral histories feature elders, teachers, farmers, hunters, wild food foragers, fishermen, cooks, and chefs describing how their people grew, prepared, and ate food in early California. After reading their stories, choose one and describe the people, settings, and actions in the text. Then compare these with how food is grown, prepared, and eaten today. (RI.3.3. Describe the relationship between a series of historical events, scientific ideas or concepts, or steps or technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.4.3. Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. RI.5.3. Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.)
Writing	Start a photo album or scrapbook of the different jobs, such as farmer, trucker, grower, butcher, and so on, involved in bringing food to the table. Look for pictures in magazines or on the Internet and then label and add them to the album. Write narratives about what it would be to like have one of the jobs from the voice of someone with that job. For example, see the website "Life on a Kansas Cattle Ranch" at http://kansascattleranch.blogspot.com. (W.3.3, W.4.3, W.5.3. Write narratives to develop real or imagined experiences or events using effective techniques, descriptive details, and clear event sequences.)

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Speaking and Listening	Interview your school's food service director to find out the sources of some of the ingredients in the school lunch. Take notes and then summarize the speaker's points afterward. (SL.3.3. Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. SL.4.3. Identify the reasons and evidence a speaker provides to support particular points. SL.5.3. Summarize the points a speaker makes and explain how each claim is supported by reasons and evidence.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Applying Disciplinary Concepts and Tools—Economics	Visit a local farm, dairy, farmers' market, processing plant, grain elevator, or grocery store to learn firsthand about the steps, resources, and people involved in bringing food from farm to table. (D2.Eco.3.3-5. Identify examples of the variety of resources [human capital, physical capital, and natural resources] that are used to produce goods and services.)
Applying Disciplinary Concepts and Tools—Geography	Read the labels of a variety of seed packets to find out whether they are suitable for your area. Compare the information against a map showing the plant hardiness zones in your region. (D2.Geo.2.3-5. Use maps, satellite images, photographs, and other representations to explain relationships between the locations of places and regions and their environmental characteristics.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
1. Essential Nutrition Concepts	Using a map of California, identify food grown in different regions of the state. Analyze reasons why an abundance of food crops is grown in California. (1h. Consider the interactions among nutrition science, ecosystems, agriculture, and social systems that affect health, including local, national, and global perspectives.)

CULTURE

Understanding Behavior: Overview

We identify ourselves through our food and food habits. How we prepare and eat food, what we eat, and when we eat it are all influenced by culture, social customs, and economic factors. By exploring food and culture through the lens of family traditions, students build an understanding of customs that have developed around food and food preparation.

Big Idea

Our family and cultural backgrounds influence the foods we eat.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Patterns	Create a questionnaire to find out friends' and family members' favorite foods, and then graph the results. Looking at the graph, what patterns emerge? (This also involves "Scientific and Engineering Practice: Using Mathematics and Computational Thinking.")
Structure and Function	Explore how the climate and other features of your geographical locale influence the foods that grow there. Develop a five-day family meal plan that incorporates a variety of local foods. (This also involves "Scientific and Engineering Practice: Obtaining, Evaluating, and Communicating Information.")

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Reading Informational Text	Read a book that describes a variety of foods and eating customs, such as *Let's Eat: What Children Eat Around the World* by Beatrice Hollyer. Choose one of the cultures in the book and interview someone from that culture. Compare that person's experience to the reading. (RI.3.6. Distinguish their point of view from that of the author of a text. RI.4.6. Compare and contrast a firsthand and secondhand account of the same event or topic; describe the differences in focus and the information provided. RI.5.6. Analyze multiple accounts of the same event, noting important similarities and differences in the point of view they represent.)
Writing	In the garden or in pots, grow plants typical to different cultures. Research and write an information page for each plant, describing how it is used in other cultures. Bind the pages together to make a class book for garden visitors. (W.3.4. With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. W.4.4, W.5.4. Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.)
Speaking and Listening	Examine the school lunch menu to find foods that come from various cultures. Discuss ways to modify the menu, either to reflect the cultural diversity in the school or district or to introduce more food options into the menu. (SL.3.1, SL.4.1, SL.5.1. Engage effectively in a range of collaborative discussions [one-on-one, in groups, and teacher-led] with diverse partners.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Applying Disciplinary Concepts and Tools—Geography	Use maps and additional resources to compare the environmental and cultural characteristics of your state to other areas of the world that have a similar climate. For example, California's climate is similar to that of areas that border the Mediterranean Sea and other parts of Africa, and northern Minnesota's climate is similar to that of areas of central Russia. (D2.Geo.3.3-5. Use maps of different scales to describe the locations of cultural and environmental characteristics.)
Applying Disciplinary Concepts and Tools—History	Create fictional restaurant menus that describe and illustrate typical foods eaten at various time periods in your state. (D2.His.2.3-5. Compare life in specific historical time periods to life today.)

National Health Education Standards

STANDARD	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
2. Analyzing Health Influences	Peruse newspaper and magazine ads related to food. What points (such as price, healthfulness, or taste) does each ad emphasize to sell the product? What other techniques or messages (such as catchy slogans, humor, or guilt) do they employ? (2.5.5. Explain how media influences thoughts, feelings, and health behaviors.)

California Nutrition Competencies

NUTRITION COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
1. Essential Nutrition Concepts	Develop an ad campaign for an uncommon fruit or vegetable, such as kiwi or kohlrabi, to convince classmates or other students to try it. Then conduct a quick survey to determine if the ad campaign was effective. (1f. Explain the influence of nutrition and physical activity on health. For Grades 3-4: Name and explain benefits of eating fruits and vegetables.)
2. Analyzing Nutritional Influences	Explore how influences such as culture, religion, medical conditions, and geography might affect food choices. Choose an influence (such as "lives in the desert," "is always in a rush," or "is a vegetarian") and name foods that a person might or might not eat because of that influence. (2. All students will demonstrate the ability to analyze internal and external factors influencing food choices and health outcomes.)

HEALTH

Maintaining Health: Overview

Like other complex organisms, the human body is a network of cells grouped into organ systems that obtain energy and building materials from food. By exploring the nutrients that different foods provide, students come to understand that a healthful diet incorporates a variety of foods. They also gain a deeper appreciation of how food and lifestyle choices affect health.

Big Idea

Food provides the energy and building materials our bodies need to grow, develop, and thrive.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Energy and Matter	Categorize the ingredients of foods by whether they primarily help the body "go," "grow," or "glow." Carbohydrates and fats provide energy (go), proteins help the body build and repair cells (grow), and vitamins and minerals help regulate body functions (glow).
Structure and Function	Develop a poster or chart that shows which parts of the body are used in different kinds of physical tasks. (This also involves "Scientific and Engineering Practice: Developing and Using Models.")
Cause and Effect	Interview a nutritionist or sports coach to find out how diet and exercise needs change over time. Find out, for example, how children's needs are different from those of adults, or how an athlete's needs are different during training and right before a sports event.

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Writing	Work in pairs to research the nutrients found in a certain food (for instance, a carrot). Make a grab bag for that food by pasting a picture of it on the outside of a bag and placing strips of paper inside with the names of nutrients (like "carbohydrates" or "vitamin A") found in that food. Then guess and compare the nutrients in different foods by looking at other grab bags. (W.3.7. Conduct short research projects that build knowledge about a topic. W.4.7. Conduct short research projects that build knowledge through investigation of different aspects of a topic. W.5.7. Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.)
Writing	Research and write vitamin and mineral labels for garden plants to communicate which plants are particularly high in specific vitamins and minerals. (W.3.2, W.4.2, W.5.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.)
Speaking and Listening	Search for information about the diet, health, and exercise of Native Americans, explorers, or early settlers in your area. What did they do to stay healthy and strong? Make oral presentations on the findings. (SL.3.4. Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. SL.4.4. Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace. W.5.4. Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Applying Disciplinary Concepts and Tools—Economics	Choose a behavior, such as following a particular diet, exercising, or smoking cigarettes, and identify the factors or incentives that influence whether or not one engages in that behavior. (D2.Eco.2.3-5. Identify positive and negative incentives that influence the decisions people make.)

National Health Education Standards

STANDARD	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
2. Analyzing Health Influences	Interview older family members about food they ate as children or about what foods were and were not considered healthy then. How and why have food choices changed? (2.5.2. Identify the influence of culture on health practices and behaviors.)
8. Health Promotion	Using wire clothes hangers and shapes cut from colored poster paper, construct healthy-lifestyle mobiles showing things children and families can do to maintain healthy bodies. Examples may be eating fresh fruits and vegetables, walking to school, or playing outside. (8.5.2. Encourage others to make positive health choices.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
5. Decision-Making for Nutrition Choices	Use a decision-making guide, like Jamieson-Petonic's around-the-clock method, for composing meals. Imagine a plate is like a clock and fill the first half of the circle (from 12:00 to 6:00) with fruits and vegetables; add lean protein to a quarter of the plate (from 6:00 to 9:00); and round things out (from 9:00 to 12:00) with a whole-grain, high-fiber starch. (5. All students will demonstrate the ability to use decision-making skills to optimize food choices and health outcomes.)

ENVIRONMENT

Sustaining Life: Overview

A food chain is the sequence of living things through which energy flows in an environment. Food chains always begin with the sun and then a plant, which uses sunlight to make food, and may continue with an animal eating the plant. A food web is made up of all the food chains in an ecosystem and shows how the plants and animals in that ecosystem are connected. Studying these relationships helps students gain a deeper understanding of how their food choices both affect and depend on other living things.

Big Idea

Food is made up of energy and matter that are passed from one organism to another.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Energy and Matter	Search for evidence of the cycling of matter in the garden—from plants to food waste to compost and back to the garden. Using a dictionary, look up these terms: producers, consumers, detritivores, and decomposers. (This also involves "Scientific and Engineering Practice: Obtaining, Evaluating, and Communicating Information.")
Structure and Function	Use owl pellets from a scientific supply house to investigate their eating habits. (Owls consume whole, small animals, such as rodents and shrews. But due to weak stomach muscles and digestive juices they cannot digest the bones and fur of their prey. They regurgitate these parts in compact pellets.) Dissect the pellets to find out how many different animals the owl ate. Discuss the structure of the owl's digestive system and its ability to consume whole prey. (This also involves "Scientific and Engineering Practice: Planning and Carrying Out Investigations.")
Stability and Change	Choose a habitat, then research and draw a food web within that habitat. What would happen if one organism in the food web disappeared? (This also involves "Scientific and Engineering Practice: Obtaining, Evaluating, and Communicating Information.")

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Speaking and Listening	Illustrate a food chain starting with a food item from dinner and working backward. Did it come from a plant or animal? Where did that plant or animal get its energy to live and grow? Continue tracing the food energy back to a plant and the sun (for example, Sun → Corn → Chicken → Person). Present food chains in an oral presentation to the class. (SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. SL.4.4. Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace. SL.5.4. Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.)
Reading Informational Text	Read a book to learn more about food chains and food webs, such as *What Are Food Chains and Webs?* by Bobbie Kalman and Jacqueline Langille. Examine the illustrations and diagrams to understand food chains and food webs. Then draw individual food webs. (RI.3.7. Use information gained from illustrations [e.g., maps, photographs] and the words in a text to demonstrate understanding of the text [e.g., where, when, why, and how key events occur]. RI.4.7. Interpret information presented visually, orally, or quantitatively [e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages] and explain how the information contributes to an understanding of the text in which it appears. RI.5.7. Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.)

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Writing	Look for things that are budding, blooming, fruiting, and dying in the garden. How are each of these stages connected to our food web? Use the words and findings to write a narrative about the garden. (W.3.3, W.4.3, W.5.3. Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
Applying Disciplinary Concepts and Tools—Economics	Research one food item on the school lunch menu. Where did it come from? How did it get to the school? What was its original source? What factors do people consider when choosing to eat a food like this? How might a student's choice to eat it or not affect food webs? (D2.Eco.1.3-5. Compare the benefits and costs of individual choices.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES 3–5
1. Essential Nutrition Concepts	Choose a wild animal and research what it eats and how it gets its food. Draw a diagram of its food web and compare it to a human's food web. Explain the relationship between the intake of nutrients and metabolism for the wild animal and for humans. (1e. Identify the physiological processes in digestion, absorption, and metabolism of nutrients.)

6–8

FOOD

Producing Food: Overview

In hunter-gatherer societies, people were able to obtain their food using only a few simple tools such as spears, fishnets, or digging sticks. Today's food system is a complex set of processes involving countless people, a multifaceted transportation system, and numerous technologies. Exploring this system is important for understanding the effects of our food choices on our society, our health, and our environment.

Big Idea

There are many ways in which humans have managed the landscape, controlled plant and animal characteristics, and used technology in order to raise crops and animals for food.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Cause and Effect	Use hydroponics as an inexpensive and relatively fast way to conduct experiments in which you monitor and control variables such as light or water. Compare differences in plant growth and development and identify the causes and effects of each result.
Systems and System Models	Model the modern food system by tracing back to their sources the journeys of specific foods available in the lunchroom. Include the people, transportation, and materials involved. What technologies are needed at each step of the journey?

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Reading Informational Text	Read local news reports about particular crops grown in your area, focusing on the impacts of factors such as weather, pests, market demand, or government policies. What claims does each news report make about how well the crop is doing? Is the evidence sufficient to support the claim? (RI.6.8. Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. RI.7.8. Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. RI.8.8. Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.)
Writing	Research the foods of an ancient culture by drawing from several sources and then write a report on your findings. What were the most common foods people ate, and how did people obtain, transport, and prepare their food? (W.6.7. Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate. W.7.7. Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation. W.8.7. Conduct short research projects to answer a question [including a self-generated question] drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.)

College, Career, and Civic Life (C3) Framework for Social Studies StateStandards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Applying Disciplinary Concepts and Tools—Economics	Research a particular crop or farm product such as apples, wheat, corn, potatoes, milk, or beef to learn which states are the top producers of that product. What roles have environmental conditions, marketing, governmental policies, and other factors had in the crop's success? (D2.Eco.8.6-8. Explain how external benefits and costs influence market outcomes.)
Applying Disciplinary Concepts and Tools—History	Research the inventions and innovations that transformed hunting and gathering societies into early agricultural societies. List ways in which this transformation changed the societies' social structures. (D2.His.1.6-8. Analyze connections among events and developments in broader historical contexts.)
Applying Disciplinary Concepts and Tools—Geography	Use online sources to examine and compare aerial photographs of your area from 10 or 20 or more years ago with photographs from today. What percentage of the land in each time period is devoted to agriculture? What other changes in land use are evident? (D2.Geo.2.6-8. Use maps, satellite images, photographs, and other representations to explain relationships between the locations of places and regions, and changes in their environmental characteristics.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
1. Essential Nutrition Concepts	Do a side-by-side comparison of heirloom and hybrid tomatoes (or corn), including taste, texture, color, nutritional value, and so on. Research the characteristics of each type of tomato or corn and the processes involved in taking it from farm to table. What are the advantages and disadvantages of each type of crop? (1g. Know principles of handling foods [growing, harvesting, transporting, processing, storing, and preparing] for optimal food quality and safety.)
1. Essential Nutrition Concepts	Prepare snacks made from the school garden or from locally grown food. Define what it means for food to be locally grown. Then discuss the trade-offs involved in eating only locally grown. (1h. Consider the interactions among nutrition science, ecosystems, agriculture, and social systems that affect health, including local, national, and global perspectives.)

CULTURE

Understanding Behavior: Overview

Food is essential for our survival, but it is also part of our cultural identity and a reflection of who we are. The ways that cultures produce, market, prepare, and consume food change over time. By looking at food and patterns of food consumption, students examine the many influences shaping cultures and explore changing cultural values and behaviors.

Big Idea

Cultures have distinctive food patterns and behaviors that can change due to a variety of influences.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Cause and Effect	Choose a technology like plowing or irrigation that changed the way people produced food in ancient civilizations. Research the effects of the technology on these civilizations. What are the possible impacts of new technologies in food production today, such as genetic modification or artificial flavors and colors?
Patterns	Design and conduct a survey about favorite foods in order to explore the influence of culture on food choices. Determine the number of responses you think are necessary to be able to draw conclusions. Include members of at least two different cultural groups in your survey. Analyze the results, looking for patterns.

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Reading Informational Text	Read a text such as *Hungry Planet: What the World Eats* by Peter Menzel and Faith D'Aluisio to learn how family meals compare in different countries and cultures. Examine how this information is presented in the text. (RI.6.3. Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text [e.g., through examples or anecdotes]. RI.7.3. Analyze the interactions between individuals, events, and ideas in a text [e.g., how ideas influence individuals or events, or how individuals influence ideas or events]. RI.8.3. Analyze how a text makes connections among and distinctions between individuals, ideas, or events [e.g., through comparisons, analogies, or categories].)
Speaking and Listening	Interview an elder about the ways in which foods have changed over his or her lifetime. Prior to the interview, work with a partner to craft questions to ask about social, personal, and technological factors that have influenced these changes. (SL.6.1, SL.7.1, SL.8.1. Engage effectively in a range of collaborative discussions [one-on-one, in groups, and teacher-led] with diverse partners on grade-level 6 topics, texts, and issues, building on others' ideas and expressing their own thoughts clearly.)
Writing	Write a short story about how foods might be different 20 years from now. (W.6.3, W.7.3, W.8.3. Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured sequences.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Applying Disciplinary Concepts and Tools—Economics	Conduct a search for "food" on *The Wall Street Journal* website. Select an article that addresses the economics of food and list the potential consequences of the article's topic on the well-being of individuals, businesses, and society. (D2.Eco.1.6-8. Explain how economic decisions affect the well-being of individuals, businesses, and society.)
Applying Disciplinary Concepts and Tools—History	Investigate the growth of the fast-food industry and identify the factors that contributed to its evolution. (D2.His.4.6-8. Analyze multiple factors that influenced the perspectives of people during different historical eras.)
Applying Disciplinary Concepts and Tools—Geography	Research and map the movement of a particular food, such as chocolate, potatoes, or tomatoes, showing where it is grown and where it is distributed around the world. (D2.Geo.8.6-8. Analyze how relationships between humans and environments expand or contract spatial patterns of settlement and movement.)

National Health Education Standards

STANDARD	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
2. Analyzing Health Influences	Prepare a dish or meal typical of a culture or time period your class is studying and analyze its nutrient content and health benefits. (2.8.2. Describe the influence of culture on health beliefs, practices, and behaviors.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
2. Analyzing Nutrition Influences	Examine media messages about food and body image that are directed to preteens and young teenagers. What characteristics of youth culture are evident in the messages? (2. All students will demonstrate the ability to analyze internal and external factors influencing food choices and health outcomes. For Grades 5-6: Describe internal and external influences that affect food choices and physical activity. For Grades 7-8: Describe the influence of culture and media on body image.)

HEALTH

Maintaining Health: Overview

We all need food to survive, but the specific foods we choose to eat can greatly affect our health and well-being. In fact, diet is directly related to a number of diseases, including obesity, heart disease, diabetes, and cancer. By taking a close look at the foods they eat and their own behaviors, students gain tools for making choices that promote health and fitness.

Big Idea

Individual bodies may have different specific requirements for health, but all people need good dietary habits, healthy personal behaviors, and a toxic-free environment for optimal health.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Cause and Effect	Research ways that diet and exercise affect muscle tone, bone strength, the circulatory system, and the respiratory system. Create posters to show others the information.
Patterns	Create graphs of the food and exercise requirements of humans at different stages of their lives—as babies, children, teenagers, young adults, middle-age adults, and elders. How do needs for energy (calories), protein, and other nutrients change?

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Reading Informational Text	Practice reading nutrition facts labels. Compare serving sizes, servings per package, calories, fat, and nutrient contents of various foods. What potentially valuable information is not contained on food labels? How can people find that information? (RI.6.1. Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. RI.7.1. Cite several places of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. RI.8.1. Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.)
Writing	Research how skipping breakfast affects learning, then develop a marketing campaign with announcements, posts, or other means to encourage students to eat a healthy breakfast. (W.6.2, W.7.2, and W.8.2. Write informative/ explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Applying Disciplinary Concepts and Tools—Economics	Find as many different forms as possible of a single food such as corn (fresh, canned, frozen, in dry mixes, in frozen entrées, and so on). Compare at least three of these products in terms of price, nutrient content, packaging, and distance traveled from their source. How do food choices affect human health and environmental health? (D2.Eco.1.6-8. Explain how economic decisions affect the well-being of individuals, businesses, and society.)

National Health Education Standards

STANDARD	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
6: Goal Setting	Keep a log of food intake and activities for a day, including sleeping, reading, sitting in class, etc. Then use a calorie chart to calculate how many calories you took in and how many you burned that day. (6.8.1. Assess personal health practices.)
7: Practicing Health-Enhancing Behaviors	Make a list of harmful behaviors and a list of healthful behaviors. Using the two lists, set a realistic personal fitness goal and monitor progress toward meeting that goal. How can young people avoid substances and behaviors that are bad for their health? (7.8.3. Demonstrate behaviors to avoid or reduce health risks to people.)

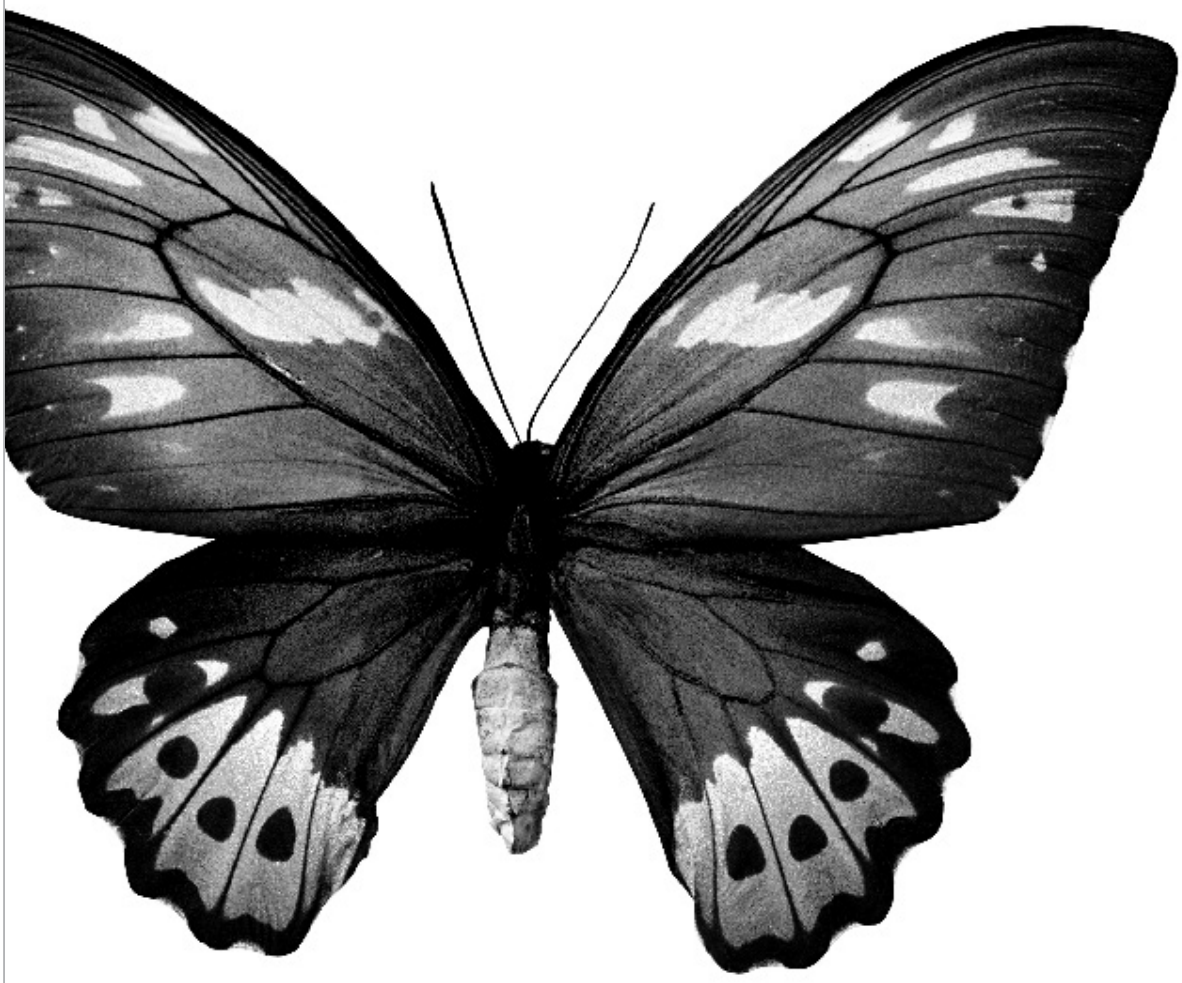
California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
1. Essential Nutrition Concepts	Bring in pictures of processed food packages for which the primary source is not obvious, for example, ketchup (tomatoes), spaghetti noodles (wheat), or french fries (potatoes). Look up the nutrient content of each processed food and compare with that of its source. (1c. Know factors affecting energy balance. For Grades 7-8: Analyze the caloric and nutritional value of foods and beverages.)
5. Decision-Making for Nutrition Choices	Choose a healthy recipe to prepare in class. How can people adapt favorite recipes to make them healthier? (5. Students will demonstrate the ability to use decision-making skills to optimize food choices and health outcomes. For Grades 5-6: Use a decision-making process to identify healthy foods for meals and snacks.)

ENVIRONMENT

Sustaining Life: Overview

Organisms are linked to one another by the food energy they need to live and reproduce. This need results in a continuous flow of energy through the organisms in an ecosystem—from the sun to food producers (plants) to food consumers (animals, fungi, and bacteria). By studying how plants use sunlight to store energy as food and then how that energy moves through an ecosystem, students gain a deeper understanding of why food is so important and how they depend on the environment to satisfy this critical need.



Big Idea

A constant influx of energy is required for organisms to sustain themselves.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Cause and Effect	To observe the effect of sunlight on plants, cover parts of leaves in the garden or schoolyard with pieces of aluminum foil. After a few days, compare the leaves with uncovered ones by testing for starch (a carbohydrate). Soak each leaf in rubbing alcohol for over two hours, and then place an iodine solution over it. Where starch is present, the iodine will turn blue-black. What does this say about sunlight and plants?
Systems and System Models	Model photosynthesis by using cards labeled C (carbon), O (oxygen), or H (hydrogen) to form the 12 molecules on the left side of the photosynthesis equation, and then regroup them to form the right side: 6 CO_2 (carbon dioxide) + 6 H_20 (water) → $C_6H_{12}0_6$ (glucose) + 6 O_2 (oxygen gas). Discuss why this process can only take place in the presence of sunlight.
Energy and Matter	Simulate energy transfer in food chains with a relay race. Each team is made of a producer, a primary consumer, a secondary consumer, and a decomposer. The producer starts with a large armful of popcorn or leaves (energy), runs and passes the energy to the next link of the food chain, and so on. Does all of the energy get passed through a food chain? Where does the rest of the energy go?

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Patterns	Take photos looking up into the canopies of trees and search for patterns that show how the shape and orientation of the trees' branches and leaves maximize the sunlight the tree can capture.

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Writing	Make a model of a food web of a local ecosystem such as a prairie, redwood forest, or tide pool. Start by researching organisms in the ecosystem—including humans. Create index cards for different organisms: Draw a picture of the organism and provide a written description of where it lives, what it eats, and who eats it. Post the cards and draw lines to show the food web connections. (W.6.2, W.7.2, and W.8.2. Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.)
Literacy in Science and Technical Subjects	Read about the flow of energy in ecosystems and the role of detritivores and decomposers. Research and describe specific decomposers and detritivores commonly present in an edible garden, their sources of food energy, and the role they play in the garden's food web. (RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

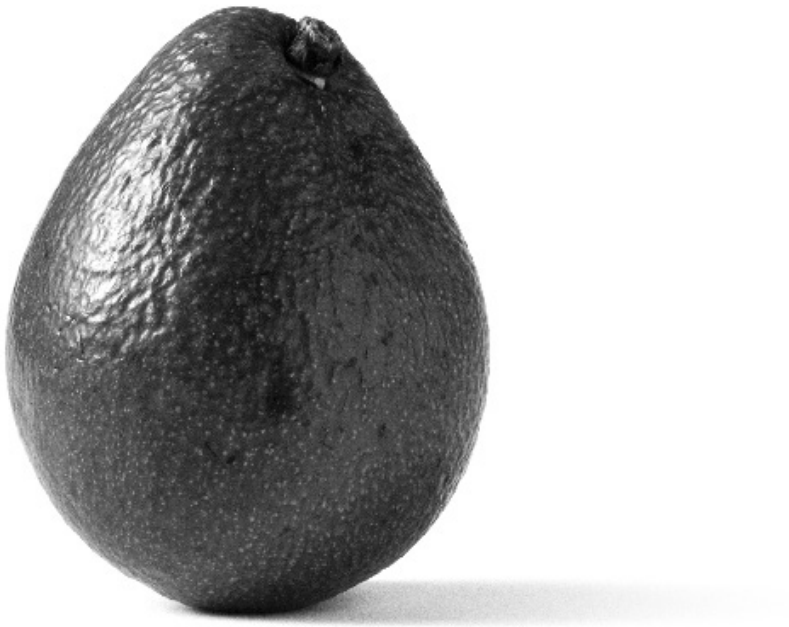
DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
Applying Disciplinary Concepts and Tools—Economics	Weigh and graph the waste generated in the school lunchroom over the course of a week. Work with the food service manager to estimate the monetary value of the wasted food. Explore the possibility of turning the food waste into energy by composting it. What would be the positive and negative effects on students, staff, and the other members of the school community? What are other ways to reduce food waste at school? (D2.Eco.1.6-8. Explain how economic decisions affect the well-being of individuals, businesses, and society.)
Applying Disciplinary Concepts and Tools—Geography	Make a map of your school garden, illustrating one or more food webs. How are people linked to these food webs? How do the physical characteristics of the garden support or interfere with food webs? (D2.Geo.1.6-8. Construct maps to represent and explain the spatial patterns of cultural and environmental characteristics.)

National Health Education Standards

STANDARD	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
1. Essential Health Concepts	Identify ways that food insecurity and hunger affect the health and well-being of children and youth. (1.8.3. Analyze how the environment affects personal health.)
6. Goal Setting	Keep track of your food intake for a day and use a calorie chart to calculate the number of calories from plant sources and the number from animal sources. (6.8.1. Assess personal health practices.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES 6–8
1. Essential Nutrition Concepts	Log caloric intake and physical activity for one week. Analyze the balance of energy (i.e., energy intake and energy expenditure) and make a plan to improve it. (1c. Know factors affecting energy balance.)
1. Essential Nutrition Concepts	Place signs in the school garden identifying the health benefits of the fruits and vegetables growing there. Create a recipe collection based on those plants and include dishes from a variety of cultures (e.g., African, Asian, European/ Mediterranean, Latin American, and Middle Eastern/Indian). (1h. Consider the interactions among nutrition science, ecosystems, agriculture, and social systems that affect health, including local, national, and global perspectives.)



9-12

FOOD

Producing Food: Overview

In order to feed itself, our society depends on a complex food system with many interdependent elements. Factors such as plants, animals, weather, technologies, health effects, cultural biases, government regulations, and world markets play a part in this system. To make informed food choices, we must recognize the influence and effects of these elements and consider the side effects and trade-offs inherent in any decision.

Big Idea

Growing and producing food is a complex process that requires making trade-offs among such components as economics, environmental costs and benefits, public health implications, animal welfare, and personal views.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Structure and Function	Investigate different varieties of a particular crop. For example, there are over 30,000 varieties of wheat in six different classes: hard red winter, hard red spring, soft red winter, durum, hard white, and soft white. How do the varieties differ from each other? How might these differences allow the wheat to grow in different conditions?

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Reading Literature	Read and analyze literature such as John Steinbeck's *The Grapes of Wrath* that shows how agriculture or food production has changed over the years. How have these changes affected people's lives and the environment? (RL.9-10.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. RL.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.)
Reading Informational Text	Read a variety of informational texts to explore issues surrounding genetically modified foods. For example, Elizabeth L. Marshall's *High-Tech Harvest: A Look at Genetically Engineered Foods* gives some insight into the techniques and issues. What are the benefits of modifying genes in our food plants, and what are the risks? (RI.9-10.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. RI.11-12.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Applying Disciplinary Concepts and Tools—Economics	Participate in a volunteer or service-learning project at the local food bank or farmers' market to experience firsthand one part of our complex food system. (D2.Eco.1.9-12. Analyze how incentives influence choices that may result in policies with a range of costs and benefits for different groups.)
Applying Disciplinary Concepts and Tools—Economics	Search for and list as many different corn-based food ingredients and products as possible, such as high fructose corn syrup, dextrose, and xanthan gum. How does the US farm policy contribute to corn being "king"? What are the trade-offs for farmers and for society of relying on one crop? (D2.Eco.8.9-12. Describe the possible consequences, both intended and unintended, of government policies to improve market outcomes.)
Applying Disciplinary Concepts and Tools—History	Explore the social and environmental impacts of the "Green Revolution" of the 1940s to 1960s that led to significant increases in food production worldwide through the use of technologies such as irrigation, synthetic fertilizers, and pesticides. (D2.His.14.9-12. Analyze multiple and complex causes and effects of events in the past.)
Applying Disciplinary Concepts and Tools—Civics	Consider a real or hypothetical food-related issue in your area, such as the planned opening of a megadairy or meat processing plant. Explore different positions on the role that economics, environmental costs and benefits, public health implications, and personal views should play in decisions involving food and food production. (D2.Civ.8.9-12. Evaluate social and political systems in different contexts, times, and places that promote civic virtues and enact democratic principles.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
1. Essential Nutrition Concepts	Explore careers related to the food system, such as farmer, soil scientist, food scientist, veterinarian, biotechnologist, grocer, transportation engineer, and economist. What decision-making strategies does each employ? (1g. Know principles of handling [growing, harvesting, transporting, processing, storing, and preparing] foods for optimal food quality and safety. For Grades 9–12: Compare and analyze food-related careers, such as jobs related to nutrition, dietetics, food technology, culinary arts, agricultural production, and food safety.)

CULTURE

Understanding Behavior: Overview

People in all cultures eat and prepare food, and we all recognize acceptable norms of behavior involving food. However, cultures differ in how these traits are expressed. Often cultural values and assumptions are so ingrained that the people growing up in a culture may not even be aware of them. By examining this cultural context, students become more aware of the ways that culture affects the decisions that societies and communities make about food.

Big Idea

The decisions a society makes about food, food production, and food practices are influenced by the prevalent culture's values, assumptions, and norms.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Cause and Effect	Examine hereditary conditions (such as lactose intolerance, allergies to wheat or nuts, or differences in metabolism due to gender) that may influence cultural food preferences.

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Literacy in Science and Technical Subjects	Take the Ecological Footprint Quiz (available on the Earth Day website, www.earthday.net) and compare your results to those from people in other countries. How does culture affect the size of one's ecological footprint? (RST.9-10.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. RST.11-12.1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions that author makes and to any gaps or inconsistencies in the account.)

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Writing	Many religions have rules about foods to be eaten or avoided, either at certain times or always. Select a major religion and design a pamphlet describing that religion's dietary rules and the reasons for them. (W.9-10.2, W.11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.)
Speaking and Listening	Debate the rights of individual farmers to use pesticides on their land versus the rights of farmworkers employed on the land, neighbors on adjacent properties, or consumers who ultimately buy the farmer's produce. Look for examples in your local news of individual rights conflicting with each other or with larger societal goals. (SL.9-10.4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning. SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Applying Disciplinary Concepts and Tools—Economics	Interview your school's food service manager about how school meal menus are developed. What economic, social, environmental, and policy-related factors influence what ultimately ends up on the plate? (D2.Eco.1.9-12. Analyze how incentives influence choices that may result in policies with a range of costs and benefits for different groups.)
Applying Disciplinary Concepts and Tools—Geography	Explore the idea of a 100-mile diet, in which people eat only foods that originate within a 100-mile radius of their home. How can people find out what is grown or raised within that area? How would this diet impact a person's life or the environment? How would a 100-mile diet in one area compare with one in another part of the country or the world? (D2. Geo.8.9-12. Evaluate the impact of economic activities and political decisions on spatial patterns within and among urban, suburban, and rural regions.)
Applying Disciplinary Concepts and Tools—Civics	Conduct a cross-cultural simulation such as Bafá Bafá (available from Simulation Training Systems, www.stsintl.com), which helps participants examine their own cultural perceptions as members of two imaginary cultures. (D2. Civ.8.9-12. Evaluate social and political systems in different contexts, times, and places that promote civic virtues and enact democratic principles.)

National Health Education Standards

STANDARD	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
2. Analyzing Health Influences	Collect a variety of magazine advertisements and images that depict healthy and unhealthy behaviors. Discuss ways that ads and images influence beliefs and practices related to personal health. (2.12.2. Analyze how the culture supports and challenges health beliefs, practices, and behaviors.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
2. Analyzing Nutrition Influences	Make a list of dining behaviors such as eating regularly, liking spicy food, sitting at a table, snacking between meals, using a fork, and so on. Categorize these behaviors as to which are universal (common to all people in all groups), cultural (common to a particular group), or personal (particular to individuals within a group). Discuss any differences of opinion about correct responses. (2. All students will demonstrate the ability to analyze internal and external factors influencing food choices and health outcomes.)
8. Nutrition Promotion	Visit a local food bank or other food assistance agency to find out how hunger is addressed in our culture. What cultural values influence actions and inactions about hunger? How do other countries respond to hunger? (8. All students will demonstrate the ability to promote and support a sustainable, nutritious food supply and healthy lifestyles for families and communities. For Grades 9–12: Develop an action plan to increase awareness of the local, national, and global factors that influence the quantity and quality of food.)

HEALTH

Maintaining Health: Overview

With recent technological and medical advances, most people have more resources for staying healthy than ever before. Yet, paradoxically, food-related diseases such as obesity and diabetes have reached epidemic levels in our country. How can this be? Even when we aim to eat healthfully, other influences such as social environment, economic forces, media messages, and public policies can all work against our best intentions. By critically examining these influences, we can strengthen our ability to make food choices that contribute to our well-being.

Big Idea

A variety of factors influence health decisions at both the personal and the societal level. They include marketing, media messages, scientific information, public policy, personal preferences, and one's friends.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Systems and System Models	Use the Internet to find infographics portraying an industrial food system and a local food system. Identify the underlying cultural assumptions and values reflected in the design of each system. Brainstorm ways that each system supports or detracts from the health of people and other living beings.

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Reading Informational Text	Compare and evaluate different sources (such as advertisements, food labels, and consumer advocate websites) for information about a health-related issue. How might each source of information help or hinder decision making on that issue? (RL.9-10.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. RL.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as the inferences drawn from the text, including determining where the text leaves matters uncertain.)
Speaking and Listening	Have a debate on whether schools should limit or eliminate access to vending machines on their campuses. (SL.9-10.4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal texts.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Applying Disciplinary Concepts and Tools—Economics	Explore the history of food labeling and dietary guidelines in the United States. What have been the positive and negative impacts of these public policies? (D2.Civ.5.9-12. Evaluate citizens' and institutions' effectiveness in addressing social and political problems at the local, state, tribal, national, and/or international level.)

National Health Education Standards

STANDARD	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
2. Analyzing Health Influences	Keep personal diaries of food intake and physical activities for a week. Analyze the factors that influenced whether or not individuals ate well or exercised on a given day. (2. Students will analyze the influence of family, peers, culture, media, technology, and other factors on health behaviors.)
8. Health Promotion	Watch the documentary *Super Size Me*. Discuss ways that American life contributes to obesity, Type II diabetes, and other food-related health problems. What can individuals, organizations, and lawmakers do to improve the situation? (8. Students will demonstrate the ability to advocate for personal, family, and community health.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
2. Analyzing Nutrition Influences	Develop a survey to learn how teenagers at your school decide what to eat for breakfast or lunch. Do they take into account cost, convenience, nutrition content, taste, advertising, friends' opinions, family expectations, or other influences? (2. All students will demonstrate the ability to analyze internal and external factors influencing food choices and health outcomes.)
8. Nutrition Promotion	Analyze school lunch menu items by rating them on a scale of 1 to 5 for nutritional value, with 1 being high-calorie, low nutrition value items (like onion rings), and 5 being healthy whole foods (like apples). If there are lower-value items on the menu, find out why, and make recommendations to your school's food service manager based on your analysis. (8. All students will demonstrate the ability to promote and support a sustainable, nutritious food supply and healthy lifestyles for families and communities. For Grades 9-12: Advocate enhanced nutritional options in the school and community.)

ENVIRONMENT

Sustaining Life: Overview

Even though most of our food today comes from farms and ranches rather than from a natural environment, we could not produce food without the help of other organisms in the food web. Our food production practices and other activities also profoundly affect food web organisms and environmental quality. Exploring the ways their food choices both depend on and affect the environment helps students make better-informed and more responsible choices.

Big Idea

Human activities can affect the vitality of food webs on which we depend.

Standards Connections

Next Generation Science Standards

CROSSCUTTING CONCEPT	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Cause and Effect	Study the dramatic decrease in honeybee populations in the United States in recent years. What are possible causes of this decrease? How might it affect food production? What are people doing about it? (This also relates to "Stability and Change.")
Stability and Change	With the help of a local biologist or resource person, survey the macroinvertebrates in your local creek or river. (Macroinvertebrates are small organisms that are a vital link in aquatic food chains. Many are sensitive to pollution, and their presence or absence can indicate the health of the body of water.) Find out whether these organisms' populations are stable or changing, and how agriculture and other human activities may affect them. (This also relates to "Cause and Effect.")
Energy and Matter	Create slide shows or posters depicting the flow of energy and cycles of matter involved in fossil fuel creation and use, including the effects of that use today.

Common Core State Standards—English Language Arts

STRAND	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Reading Informational Text	Read some or all of *Animal, Vegetable, Miracle: A Year of Food Life* by Barbara Kingsolver et al., an account of one family's resolve to eat only locally grown food. Discuss what class members would be willing to do to reduce the environmental effects of their food choices. What uncertainties does it raise? (RI.9-10.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.)
Writing	Discuss the fact that with over 850 million people in the world not getting enough to eat, many people believe that the need to produce the most food at the cheapest cost outweighs most environmental consequences. Write an essay supporting or disputing this belief, using valid reasoning and evidence to back your chosen position. (W.9-10.1, W.11-12.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.)

College, Career, and Civic Life (C3) Framework for Social Studies State Standards

DIMENSION	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
Applying Disciplinary Concepts and Tools—Geography	Find out how land use rules in your state or region promote or limit development. How do these rules affect the food web in your area? What impact do they have on food production for humans? (D2.Geo.5.9-12. Evaluate how political and economic decisions throughout time have influenced cultural and environmental characteristics of various places and regions.)
Applying Disciplinary Concepts and Tools—History	Research how declines in food and other resources contributed to the collapse of a civilization such as the Roman Empire or the ancient Pueblo people. (See *Collapse: How Societies Choose to Fail or Succeed* by Jared Diamond for some historic and modern examples.) What can people learn from the fate of this civilization? (D2.His.1.9-12. Evaluate how historical events and developments were shaped by unique circumstances of time and place as well as broader historical contexts.)

National Health Education Standards

STANDARD	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
1. Essential Health Concepts	Research how specific birds, insects, and other wildlife help humans grow plants in farms and gardens. How are environmental health and human health interconnected? Design a garden that provides food for humans and also supports beneficial wildlife. (1.12.3. Analyze how environment and personal health are interrelated.)

California Nutrition Competencies

COMPETENCY	SAMPLE STUDENT ENGAGEMENT, GRADES 9–12
1. Essential Nutrition Concepts	Trace a food item from a favorite meal back to its original plant sources. Research the impacts on the quality of the food item and on the environment at each step of the pathway from plant to plate. (1g. Know principles of handling [growing, harvesting, transporting, processing, storing, and preparing] foods for optimal food quality and safety. For Grades 9-12: Describe the advantages and disadvantages of food processing, including the effects on food quality, safety, nutrient content, and the environment.)

About the Center for Ecoliteracy

The Center for Ecoliteracy is a nonprofit organization that advances ecological education in K–12 schools. Founded in 1995, the Center engages with school communities, foundations, civic leaders, and other change agents at multiple levels of scale from the local to the national. It creates and publishes books and guides, facilitates professional development and conferences, and provides strategic consulting to schools and businesses.

The Center has published dozens of free downloadable resources for educators and nearly 150 essays and interviews with leading thinkers, educators, and policy makers. Its books include *Ecoliterate: How Educators Are Cultivating Emotional, Social, and Ecological Intelligence* (Jossey-Bass, 2012); *Smart by Nature: Schooling for Sustainability* (Watershed Media, 2009); and *Ecological Literacy: Educating Our Children for a Sustainable World* (Sierra Club Books, 2005). Well known as a leader in K–12 school food reform and school gardens, the Center developed the *Rethinking School Lunch* guide and planning framework; collaborated with the Berkeley Unified School District and Chez Panisse Foundation in the School Lunch Initiative; and is partnering with Oakland Unified School District in the Rethinking School Lunch Oakland initiative.

The Center's food-related resources include *Big Ideas: Linking Food, Culture, Health, and the Environment*; the cookbook and professional development guide *Cooking with California Food in K–12 Schools*; *Making the Case for Healthy, Freshly Prepared School Meals*; and classroom discussion guides for Academy Award-nominee *Food, Inc.* and the *nourish: food + community* series. To learn more, see **www.ecoliteracy.org**.

CENTER FOR ECOLITERACY

About the National Geographic Society

Founded in 1888, the National Geographic Society is one of the world's largest nonprofit scientific and educational organizations. With a mission to inspire people to care about the planet, the member-supported Society offers a community for members to get closer to explorers, connect with other members, and help make a difference. The Society reaches more than 500 million people worldwide each month through its media platforms, products, and events. National Geographic has funded more than 11,000 scientific research, conservation, and exploration projects and supports an education program promoting geographic literacy. For more information, visit **www.nationalgeographic.com**.

NATIONAL GEOGRAPHIC

About the National Geographic Center for Geo-Education

National Geographic is dedicated to helping young people learn about their interconnected world. Through its Center for Geo-Education, it creates learning materials and educational experiences for learners and the adults who teach them. The Center's mission is to make sure that young people receive the education about their dynamic, interconnected world that they will need to function effectively and act responsibly throughout their lives. More information about the Center is available at **NatGeoEd.org**.

CREDITS

Zenobia Barlow Publisher

Carolie Sly, Leslie Comnes Authors

Michael K. Stone Editor

Wendy Ledger, Mark Rhynsburger Proofers

Karen Brown Designer

Monica Bueb Production

Alexa Norstad Project Coordinator

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