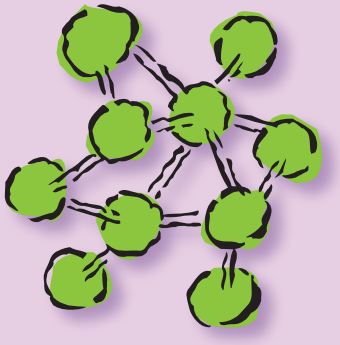
Linking Science and Nutrition

Tips, Lessons, and Resources for Integrated Instruction



CHAMPIONS for CHANGE
Network for a Healthy California

CDPH California Department of PublicHealth

CALIFORNIA Healthy Kids RESOURCE CENTER

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This material was produced by the California Department of Public Health, *Network for a Healthy California*, with funding from the USDA Supplemental Nutrition Assistance Program (formerly the Food Stamp Program). These institutions are equal opportunity providers and employers. In California, food stamps provide assistance to low-income households, and can help buy nutritious foods for better health. For food stamp information, call (877) 847-3663. For important nutrition information, visit http://www.cachampionsforchange.net.

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Table of Contents

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Introduction

Schools offer many opportunities to promote healthy food and activity choices. One promising approach is "integrated instruction," which strategically links methods, tools, perspectives, and application of multiple disciplines. Using disciplinary tools, students explore varied facets and interrelationships of phenomena, and apply this information to real-life questions (such as health-relevant choices). For many students, these enriched learning experiences may lead to fuller conceptual understanding and skill application than studying single subjects in isolation. Moreover, the concentrated hands-on and mental activities make integrated instruction engaging to most students. *Linking Science and Nutrition* uses integrated instruction strategies to teach science and nutrition simultaneously, in a mutually-enhanced fashion.

Linking Science and Nutrition is a set of 12 Linking Lessons designed to address both the California science content standards, and the newly-adopted health education content standards for nutrition and physical activity. The lessons support the recommended grade-level standards and emphasize the *Network for a Healthy California* objectives to improve fruit and vegetable consumption and increase physical activity.

Each *Linking Lesson* fosters student acquisition of science and health concepts and skills. Students question, collect and examine data, derive conclusions, reflect and evaluate results with familiar food supplies and nutrition information. In turn, students are asked to apply science-based information to real-life choices. Lesson extension and assessment activities encourage students to positively influence the school nutrition environment.

The lessons are designed to be easily incorporated into existing science or nutrition programs. Each lesson identifies science and nutrition learning goals, grade-level science and health standards addressed, and preparation and activity times. In addition, step-by-step directions, familiar materials, and assessment activities make these lessons "classroom ready." The "Tips for Success" sections provide additional background, directions, and resources for effective science and nutrition integrated instruction.

At-A-Glance

Linking Lessons and California Science and Health Education Content Standards Connections

Linking Lesson Title and Description	Science Content Standards	Health Education Content Standards
Kindergarten Students use their senses to investigate fruits and vegetables and plant parts.		
Linking Lesson 1—Super Senses Students predict and use their senses to observe and identify fruits and vegetables. As a class, students track fruit and vegetable snacks.	**Physical Sciences** 1a Describe objects and physical properties **Life Sciences** 2a Compare plants and animals **Investigation and Experimentation** 4a Observe objects using the five senses 4b Describe the properties of common objects 4e Communicate observations	**Essential Concepts** Kindergarten: 1.1.N Name healthy foods 1.2.N Identify healthy snacks **Practicing Health-Enhancing Behaviors** Kindergarten: 7.1.N Select nutritious snacks
Linking Lesson 2—Plant Parts for Breakfast? Students use their senses to observe characteristics of commonly-eaten plant parts and plan a breakfast.	**Physical Sciences** 1a Describe objects and physical properties **Life Sciences** 2c Identify plant and animal structures **Investigation and Experimentation** 4a Observe objects using the five senses 4b Describe the properties of common objects 4d Compare and sort 4e Communicate observations	**Essential Concepts** Kindergarten: 1.4.N Recognize the importance of breakfast **Practicing Health-Enhancing Behaviors** Kindergarten: 7.2.N Plan a nutritious breakfast
Grade Two Students compare the ways that flowers attract pollinators with how cereal companies attract customers.		
Linking Lesson 3—Is This a Healthy Attraction? Student teams discover methods of attraction used by flowers, fruits, and popular cereals. They determine whether advertised cereals are healthy choices, then brainstorm healthier breakfast options.	**Life Sciences** 2f Flowers and fruits **Investigation and Experimentation** 4c Compare and sort	**Essential Concepts** Grade Two: 1.3.N Discuss benefits of a nutritious breakfast **Analyzing Influences** Grade Two: 2.1.N Discuss influences on food choice **Practicing Health-Enhancing Behaviors** Grade Two: 7.1.N Examine importance of eating breakfast daily

Linking Lesson Title and Description	Science Content Standards	Health Education Content Standards
Grade Four Students investigate nutrients provided by whole foods versus processed foods, the benefits of a varied diet, and safe food storage.		
Linking Lesson 4—Whole or Processed: Which is Better for Me? Student teams make predictions, then compare and contrast the nutrients in whole versus processed forms of a variety of plant foods.	**Life Sciences** 2a Plants and energy **Investigation and Experimentation** 6a Observations and inference 6c Predictions 6e Construct graphs	**Essential Concepts** Grade Four: 1.1.N Identify key nutrients **Accessing Valid Information** Grade Four: 3.2.N Determine nutrient and sugar content from labels **Goal Setting** Grade Four: 6.1.N Make a healthy food and beverage plan
Linking Lesson 5—Extreme Eating Students compare the nutrients in foods eaten by herbivores, carnivores, and omnivores. They predict and explore the health consequences of eating a limited diet.	**Life Sciences** 2b Food chains and food webs **Investigation and Experimentation** 6c Formulate and justify predictions	**Essential Concepts** Grade Four: 1.1.N Identify key nutrients 1.3.N Describe the relationship between food, physical activity, and health **Accessing Valid Information** Grade Four: 3.2.N Determine nutrient and sugar content from labels
Linking Lesson 6—Keep It Fresh! Student teams observe characteristics of fruits and vegetables before and after conducting a simple food storage experiment, and they find resources for more food safety information.	**Life Sciences** 2b Food chains and food webs **Investigation and Experimentation** 6a Observations and inference 6c Formulate and justify predictions 6f Follow written instructions	**Essential Concepts** Grade Four: 1.4.N Identify safe food preparation and storage 1.5.N Explain how germs in food can cause illness **Accessing Valid Information** Grade Four: 3.1.N Identify healthy food resources

Linking Lesson Title and Description	Science Content Standards	Health Education Content Standards
Grade Five Students discover food sources of chemical compounds and investigate how sugar, salt, fat, and fiber affect their bodies.		
Linking Lesson 7—Compounds in My Food Student teams measure and compare the amounts of sugar, salt, and fat in common snack foods. Students use this information to create a display of healthy and less-healthy snack choices.	**Physical Sciences** 1f Mixtures and compounds **Life Sciences** 2g Plants and animals break down sugar to make energy **Investigation and Experimentation** 6f Select appropriate tools 6g Record data and make inferences 6i Write a report	**Essential Concepts** Grade Five: 1.6.N Differentiate between more- and less-nutritious snacks 1.7.N Explain moderate eating **Accessing Valid Information** Grade Five: 3.2.N Interpret food labels **Practicing Health-Enhancing Behaviors** Grade Five: 7.1.N Use guidelines to identify healthy snacks
Linking Lesson 8—Fiber Race Tract Student teams compare the rates in which high-fiber versus low-fiber foods move through a simulated digestive system. Students plan a menu to include more fiber.	**Life Sciences** 2c Roles of organs and steps in digestion **Investigation and Experimentation** 6b Develop a testable question 6c Plan and conduct an investigation 6e Use a variable to collect data about an experiment	**Essential Concepts** Grade Five: 1.3.N Examine the relationship of nutrients and metabolism 1.6.N Differentiate between more- and less-nutritious snacks 1.8.N Describe the benefits of a balanced diet **Accessing Valid Information** Grade Five: 3.2.N Interpret food labels **Decision Making** Grade Five: 5.1.N Use a decision-making process to identify healthy foods

Linking Lesson Title and Description	Science Content Standards	Health Education Content Standards
Grade Seven Students research how genes and the environment can influence health. They discover how fruit protects the seed and helps in seed dispersal. They examine their fruit intake and make a plan for improvement.		
Linking Lesson 9—Genes, the Environment, and Active Prevention Student teams research several nutrition-related chronic diseases and their connections to genes and the environment. They use their findings to develop their own "dietary guidelines."	**Genetics** 2c Reproduction and inherited traits **Structure and Function** 5a Levels of organization 5b Systems **Investigation and Experimentation** 7a Test, collect, display data 7b Use print and electronic resources 7e Communicate steps and results	**Essential Concepts** Grades Seven and Eight: 1.1.N Describe the impact of nutrition choices on health 1.5.N Differentiate between healthy and disease-causing diets 1.10.N Identify the impact of nutrition on chronic disease **Accessing Valid Information** Grades Seven and Eight: 3.1.N Distinguish between valid and invalid nutrition information sources
Linking Lesson 10—Tasty Packages Student teams dissect and examine a variety of fruits, and classify different types of fruits by their structure.	**Structure and Function** 5a Levels of organization for structure and function 5f Structures and processes of plant reproduction **Investigation and Experimentation** 7a Use tools and technology 7d Construct models, maps, and diagrams 7e Communicate steps and results	**Essential Concepts** Grades Seven and Eight: 1.2.N Identify nutrients and their relationship to health 1.4.N Describe how to keep food safe 1.8.N Identify healthy food preparation methods **Practicing Health-Enhancing Behaviors** Grades Seven and Eight: 7.1.N Make healthy choices 7.2.N Explain proper food handling

Linking Lesson Title and Description	Science Content Standards	Health Education Content Standards
Grade Eight Students investigate how chemical reactions affect foods and health. They also examine the role of food safety in preventing foodborne illness.		
Linking Lesson 11—Glorious Guacamole Student teams conduct experiments to identify the ingredient in guacamole that prevents oxidation. They also learn about safe food handling.	**Reactions** 5a Reactions and products 5e Acids and bases **Investigation and Experimentation** 9a Investigation 9b Evaluate accuracy and reproducibility of data 9c Variables and controls	**Essential Concepts** Grades Seven and Eight: 1.2.N Identify the relationship of nutrition to health 1.3.N Examine health risks associated with food contaminants 1.4.N Describe safe food purchasing, preparation, and storage 1.10.N Identify the impact of nutrition on chronic disease **Practicing Health-Enhancing Behaviors** Grades Seven and Eight: 7.1.N Make healthy food choices 7.2.N Examine safe food handling practices
Linking Lesson 12—Fast-Food Frenzy Students research popular fast-food restaurants and evaluate the nutritional value of foods served. They use the results of their evaluation to create three balanced fast-food meals.	**Chemistry of Living Systems** 6c Molecules in living systems **Investigation and Experimentation** 9e Construct graphs from data	**Essential Concepts** Grades Seven and Eight: 1.2.N Identify the relationship of nutrition to health 1.5.N Differentiate between healthy and disease-causing diets 1.6.N Analyze caloric and nutritional value of foods **Accessing Valid Information** Grades Seven and Eight: 3.3.N Access restaurant nutrition facts **Practicing Health-Enhancing Behaviors** Grades Seven and Eight: 7.1.N Make healthy food choices in a variety of settings

Tips for Success

Integrating Science and Nutrition

The integrated teaching in *Linking Science and Nutrition* blends instruction in science and nutrition to achieve meaningful learning objectives in both subjects. Throughout the lessons, students practice key science skills, such as inquiry, as well as nutrition skills, such as accessing valid health information, and analyzing influences on food choices. Well-planned integrated lessons are enriched learning opportunities that can motivate students to practice new skills, develop personal meaning, and adopt healthier behaviors (Drake 2004). The tips below promote successful science and nutrition integration.

Emphasize cross-disciplinary skills and concepts (e.g., information management, research, communication, design and construction, prediction)

1. Identify connections between subject areas; point out common themes and cross-disciplinary skills.
2. Emphasize learning approaches that build problem-solving skills.
3. Before starting investigations, encourage students to plan how to gather data, and how they will present the findings to other student groups.
4. Use investigations to generate data that leads students to draw conclusions and discover concepts.
5. Provide opportunities for written and oral communication of investigations and findings.
6. Review the grade-level nutrition and science content standards, and highlight those that address needs and outcomes emphasized by school and *Network for a Healthy California* programs.

Avoid superficial connections that do not meaningfully address both subjects

1. Be familiar with the standards for both disciplines, focus instruction on the concepts and skills identified by the standards.
2. Identify, analyze, and interpret what the students should be able to know and do based on the standards in both disciplines.
3. Ensure the lesson has meaningful, standards-aligned student learning objectives for each area of integration.
4. Cite the standards for both disciplines that are addressed in the lesson.
5. Build additional integrated lessons from the adopted science and health education texts. These resources supply high-quality lesson plans, ideas for integration, and guidance for placement of integrated lessons.

Use the disciplinary tools of science to examine nutrition concepts and skills

1. Select lessons based on a real-life nutrition question, problem, or issue.
2. Emphasize applying the scientific method, as well as science and nutrition skills, to explore nutrition questions. (See "Tips for Success: Using Inquiry-Based Instruction and the Scientific Method," page 5.)
3. Include lessons that require students to use skills and concepts to investigate scientific questions.
4. Choose lessons that allow students to apply science and nutrition knowledge and skills in real-life situations.
5. Find lessons that encourage self-responsibility for healthful food choices.
6. Include investigations that require minimal equipment.
7. Promote teamwork and skill development by incorporating group and independent investigation, and skill practice. (See "Tips for Success: Coordinating Student Scientist Teams," page 9.)

Include strategies that assess student learning in both content areas

1. Keep science and nutrition standards in mind when selecting learning outcomes to assess.
2. Use discussion questions before and after the investigation to explore student knowledge and understanding.
3. Use assessment activities that address both science and nutrition concepts and skills.
4. Plan assessment activities that are relevant and simulate real-life student experience.
5. Have students complete and compile lab reports as an assessment of both science and nutrition learning objectives. (See "Tips for Success: Coordinating Student Scientist Teams," page 9.)

Additional Resources

California Department of Education—http://www.cde.ca.gov
This site provides access to download science and nutrition standards and frameworks, adopted texts, and other important publications.

Tips for Success

Maintaining a Safe and Positive Classroom

Creating a physically and emotionally safe environment protects students' health and well-being, while conducting successful integrated lessons. The Linking Lessons involve students in teamwork and hands-on investigations using a variety of foods and equipment. The tips below contribute to a safer, and more positive science and nutrition learning setting.

Put safety first

1. Review the *Science Safety Handbook for California Public Schools*, California Department of Education. (See "Additional Resources" at the end of this section.)
2. Invest in safe learning by dedicating a lesson to safety at the start of the program.
3. Post classroom safety standards in a prominent location. Use the safety guide in the adopted science text to have students develop a safety poster to review before each hands-on activity.
4. Determine which students have food allergies by checking with students, school nurses, child nutrition services, and parents. Review steps for protecting students with food allergies. (See "Additional Resources" at the end of this section.)
5. Before every hands-on activity, take time to review the safety standards with students.
   - Emphasize the importance of sanitation when working with food, including washing hands and cleaning surfaces.
   - Assign a safety coordinator for each student group. (See "Tips for Success: Coordinating Student Scientist Teams," page 9.) Hold a safety coordinators' meeting prior to the activity to ensure that information about safety standards and equipment is passed on to group members.
6. After each hands-on activity, lead students to reflect on how the safety standards were followed, and any that could have been followed more effectively.
7. Assess students' knowledge of classroom safety using the *What-Not-To-Do Lab* handout by the National Laboratory Safety Institute. (http://expedioscientiam.net/school/resources).

Establish a positive classroom culture

1. Encourage students to turn their "minds on" by asking questions to encourage them to examine ideas from different perspectives. Rather than labeling ideas as right or wrong, encourage students to examine the strengths and weaknesses of different answers.
2. Accommodate diverse learning styles by encouraging students to express their ideas in different ways: writing, speaking, sketching, and drawing. Use a variety of modalities to convey concepts and support skill development (e.g., photos, diagrams, sounds, and models).
3. Maintain a supportive climate by immediately stopping "put downs," teasing, and negative remarks.
4. Model collaborative work, discuss group dynamics, and facilitate students to work together to reach group goals.
5. Model and use respectful communication. Involve all students in inquiry and discussions. Provide all students with opportunities to act as team facilitators.
6. Teach responsibility and model care of equipment, attention to safety, personal accountability, and application of good judgment.
7. Remind students of classroom expectations, and procedures for cleaning and returning materials. Check desks and work areas before students leave. Ensure that everything is put away and cleaned. Remind students to wash hands with soap and water before leaving.

8. Encourage students to ask questions and conduct further research using the library, Internet, home resources, or experts in the field. Inspire them to keep learning.

Additional Resources

California Department of Education–Science—http://www.cde.ca.gov/pd/ca/sc
This site provides publications, frameworks, professional development, and other resources to support science instruction. The *Science Safety Handbook for California Public Schools* can also be downloaded from this Web site.

The Food Allergy & Anaphylaxis Network—http://www.foodallergy.org
This site includes preschool and school-based resources for communicating and managing food allergies.

National Science Teachers Association—http://www.nsta.org
This site offers online seminars, resources, instructional tools, conferences, and articles to support effective science instruction.

The Laboratory Safety Institute—http://www.labsafety.org
The site provides resources and safety training for science teachers.

Partnership for Food Safety Education—http://www.fightbac.org
This site includes educational materials, lessons, and research on food safety.

Tribes: A New Way of Learning and Being Together—http://www.tribes.org
The Web site furnishes references, resources, and professional development to ensure a positive school and classroom environment.

Tips for Success

Using Inquiry-Based Instruction and the Scientific Method

Students build science knowledge, skills, and understanding by practicing the scientific method through inquiry-based instruction. In each *Linking Lesson* a "focus-setting question" or scenario poses a simple problem to set the stage for student inquiry. Active inquiry continues as students access prior knowledge, formulate scientific questions, and plan strategies to answer questions by systematically gathering and analyzing data (Allen 2006 and Olson 1996). The following tips offer strategies for supporting students' full participation in inquiry-based instruction and application of the scientific method.

Activate students' prior knowledge

1. Engage students in conversations about what they already know.
2. Provide background information using articles, stories, pictures, demonstrations, or other sources of introductory information.
3. Ask students to suggest unanswered questions they have about the topic.
4. Have the class generate ideas about what kinds of information would help to answer some of these questions (i.e., what would useful "data" look like?).
5. Post the lesson's learning goals and inquiry question, and give students time to reflect on these.

Keep students involved in the inquiry process

1. Ask open-ended questions.
2. Allow wait time after asking questions to encourage thoughtful reflection. Encourage a variety of students to share thoughts.
3. Avoid telling students what to do.
4. Encourage students to find solutions on their own.
5. Encourage collaboration among students.
6. Acknowledge that inquiry can be challenging, and be prepared to provide more guidance for students who become frustrated.

Support students to generate scientific questions that can be answered by investigation

1. Guide the class to focus on a question that can be addressed through gathering information.
2. Take time to ensure that the class understands the question and the evidence (data) that will be needed to address it.
3. Avoid questions that are too open-ended to be answered by one experiment. Effective scientific questions often focus on how one variable (e.g., time, length, weight) is affected by another (e.g., heat, type of material, water).

Encourage students to propose a hypothesis that can be supported, or not supported, by evidence (data)

1. Lead students to generate an educated guess about the question based on prior knowledge.
2. Guide the class to create a hypothesis that is reasonable, based on the kind of evidence that will be gathered during the day's activity. (It is important to note that some questions can only be partially addressed with the data available.)

Focus students on the investigation

1. Have students work together to come up with a feasible plan to gather the data.
2. Help students stay focused on the question, the investigation, and the type of evidence (data) that will be needed. Sample questions to ask students:
   - What will we be learning from this activity?
   - What evidence is needed to answer the question(s)?
   - How will we observe and record this information?
   - Why are we measuring this variable?
3. Before, during, and after the investigation, ask students to analyze the strengths and weaknesses of using the procedure.
4. Ask students to explain why they are taking each step, and how it fits into the investigation. Sample questions:
   - What information or evidence is gained by doing this step?
   - What data are you recording about your observations during each step of the investigation?

Help students organize, compile, and present data

1. Use visual and verbal strategies to summarize and present evidence (data) gained from the investigation.
2. Explore a variety of data summary and reporting formats, including a chart, graph, or written summary. Have the students use poster board or a video to create their report.

Discuss student conclusions and evaluation

1. Ask students to review the evidence and discuss (in their groups or as a class) what the information reveals and what is still needed to test the hypothesis. Does the evidence gathered support or refute the hypothesis?
2. Invite students to discuss whether this investigation was an effective way to answer the question.
3. Have students speculate about what could be done next to gather more information to help answer the question.

Encourage student reflection

1. Ask student teams to discuss and report on how well they worked together to obtain the information needed.
2. Request that students discuss, orally or in writing, whether the collected information can be trusted.
3. Ask students to individually write conclusions about the investigation; then discuss with their teams and agree on a group conclusion.
4. Explore the repeatability of the observations and the consistency of the methods. (How much variation in results did the teams experience? Did different teams use different approaches to gathering and recording the data?)
5. Ask students to write lab reports about what they learned from the investigation. Are any other data needed to answer the question(s)? What could be done to find out more?

Additional Resources

Environmental Literacy Council—http://www.enviroliteracy.org
This site is dedicated to helping teachers, students, policymakers, and the public access curricula and cross-disciplinary resources on the environment, including tips for teaching inquiry.
http://www.enviroliteracy.org/article.php/1271.php.

Lawrence Hall of Science—http://www.lawrencehallofscience.org
This site by the University of California, Berkeley, provides resources, research, and professional development in the fields of science and mathematics education.

National Science Foundation K-12 Outreach Program—
http://www.science-house.org/CO2/educators/tips.html
This site supplies tips, programs, workshops, fieldtrips, and resources for teaching science in the classroom.

Coordinating Student Scientist Teams

In *Linking Science and Nutrition*, students act as scientists and work in teams to investigate properties of foods, advertising, digestion, and disease prevention. By planning and coordinating an investigation, as in real laboratories, students gain both scientific knowledge and critical-thinking and problem-solving skills. Applying the suggestions below contribute to more organized and manageable student investigations, and provide students with practice working together. The guidelines and templates in this section should be adapted to the developmental level of the students.

Organize for success

1. Provide each student with a laboratory notebook at the beginning of the school year. Ask students to keep careful, neat records of questions addressed, hypotheses, data, and conclusions for each activity. A suggested template for writing lab reports is included in this section.
2. Create and post a summary of the roles of each student scientist team member or create laminated cards with student roles to distribute prior to starting an investigation. A template for student scientist team role cards is included in this section.
3. Plan ahead for material needs by establishing a material list for each lesson, and create a place in the classroom where the materials for each group can be stored neatly (e.g., in separate crates or shelves for each group).
4. Review and practice investigation and cleanup procedures before any hands-on activity. Provide students with specific instructions and expectations for cleaning and returning materials and equipment to storage areas.

Establish student scientist teams

1. Define student roles, for example:

Safety Coordinator
- Obtains and distributes safety gear and monitors its proper use during investigations.
- Attends safety briefing meetings and reports back to the team.
- Evaluates the group's safety performance (this can be in written form or as an oral report to the class).

Material Coordinator
- Obtains and distributes materials for the activity, and ensures that every member of the team has read and understands the instructions.
- Ensures all materials are returned to their place at the end of the investigation.
- Coordinates the team to cleanup its work space at the end of the activity.

Data Recorder
- Ensures that the team members understand what data are being gathered.
- Records and organizes the data.
- Checks whether all team members have recorded the data in their laboratory notebook or work sheet.

Data Reporter
- Organizes the data.
- Leads a team discussion on what the data means.
- Decides how to best communicate this information to the whole class.

Teamwork Facilitator
- Assigns specific investigation activity tasks (e.g., stop watch, stirring, measuring) to team members so that everyone has an equal chance to participate.

- Ensures that all team members understand their investigation tasks and team roles.
- Encourages team members to support each other in carrying out their tasks.
- Evaluates the team's performance.

2. Modify the roles (as appropriate) for the developmental level of the students.
3. Emphasize that, while one student will be responsible for each of the roles, all team members must understand that together they contribute to the success of the investigation.
4. Ask the class to list each of the team roles and each role's responsibilities in their laboratory notebooks for future reference.
5. During the investigation activity, monitor each team's working dynamic. If there are problems, ask the team for solutions, and help them agree on actions to improve their work. Make suggestions only as needed. Express appreciation and affirmation of positive changes in team work.

Additional Resources

Environmental Literacy Council—http://www.enviroliteracy.org
This site is dedicated to helping teachers, students, policymakers, and the public access curricula and cross-disciplinary resources on the environment, including tips for teaching inquiry.
http://www.enviroliteracy.org/article.php/1271.php.

National Science Foundation K-12 Outreach Program—
http://www.science-house.org/CO2/educators/tips.html
Use this Web site to find tips, programs, workshops, fieldtrips, and resources for teaching science in the classroom.

Tribes: A New Way of Learning and Being Together—http://www.tribes.org
This site furnishes references, resources, and professional development to ensure a positive school or classroom environment.

Student Lab Report Instructions

Title

- Include a brief, concise, and descriptive title of the investigation.

Include the names of the team members and their roles

State the question to be investigated

- What question(s) is to be answered by completing the investigation?
- Write a brief description of preliminary observations or background information that helps answer the question.

Hypothesis

- Write a statement that predicts the answer to the question or outcome of the investigation.
- Make sure this possible solution is a complete sentence.

Material

- List all items used in the investigation.

Procedure

- Use complete sentences to write a paragraph that explains the steps of the investigation.
- Write the steps of the procedure so that others could repeat the investigation.

Results (Data)

- Include data tables, observations, or additional notes made during the investigation.
- Attach a separate sheet(s), if necessary.
- Label all tables, graphs, and charts.

Conclusions

- Accept or reject the hypothesis.
- Explain why the hypothesis was accepted or rejected using data from the investigation.
- Include a summary of the data to help the reader understand the results (e.g., ranges, averages).
- List one thing learned and describe how it applies to a real-life situation.
- Discuss any possible errors that might have occurred in the collection of the data, and how these errors may have affected the results and conclusion. Suggest ways to avoid these errors in future investigations.

Reflections

- Write a brief paragraph about the investigation. Include science and nutrition insights and skills gained, and describe how these might apply to a real-life situation.

Student Lab Report

Name_____

Team member names and roles

Material Coordinator_____ Teamwork Facilitator_____

Data Recorder_____ Safety Coordinator_____

Data Reporter_____

Title _____

State the question to be investigated_____

_____

Hypothesis_____

_____

Materials_____

_____

_____

Procedure_____

_____

_____

Results (Data)_____

_____

_____

Conclusions_____

_____

_____

Reflections_____

_____

Student Scientist Team

Role Cards

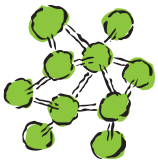
Safety Coordinator

- Distribute safety gear
- Make sure the team is using the safety gear correctly
- Go to safety meetings and report back to the team
- Evaluate the team's safety performance

Material Coordinator

- Distribute materials for the activity
- Make sure every team member reads and understands the directions
- Make sure all materials are returned to their place
- Coordinate the team to clean the work area at the end of the activity

Data Recorder



- Check that team members understand what data are to be collected
- Record and organize the data for the investigation
- Make sure all team members record the data in their laboratory notebooks or work sheets

Data Reporter

- Summarize the data
- Lead a team discussion on what the data means
- Decide how to best present the team's findings to the whole class
- Report team's results to the class

Teamwork Facilitator

- Assign roles to team members
- Check that all team members understand their job
- Encourage team members to support each other in carrying out their roles
- Evaluate the group's teamwork

Providing Skill-Based Nutrition Instruction

The California health education content standards provide the nutrition content and skills necessary to build positive student nutrition behaviors. Because seven of the eight health content standards target essential skills, skills-based instruction is an important tool for developing students' skills, such as communication, assessing accuracy of information, goal setting, decision making, and health promotion (California Department of Education 2008). These skills enable students to develop personal confidence and to handle social pressures and avoid or reduce unhealthy nutrition behaviors. For each grade-level and skill, skills-based instruction guides students through a series of developmental steps.

When preparing for skills-based nutrition instruction carefully select appropriate nutrition content and context, apply and reinforce the steps for skills-based instruction, and include a variety of teaching methods.

Select appropriate nutrition content and context

1. Focus on the concepts and skills in California's health education content standards, students don't need to learn it all at once, use the standards to guide knowledge and skill development.
2. Include situations and activities that are current, relevant, and applicable to students' daily lives. Talk to students and parents and get to know the nutrition products, situations, and decisions they face each day. Build these into your skills-based lessons and activities to help personalize information.
3. Choose age-appropriate situations and activities for skill development. For example, elementary students may learn to access valid information from health care staff, parents, and teachers; whereas middle or high school students may learn and practice evaluating and accessing information from Internet sites.
4. Include information, examples, and activities that are inclusive of diverse cultures and lifestyles, such as gender, ethnicity, religion, ability, and appearance.
5. Refer to the California adopted health education texts for additional lessons with grade-appropriate, skills-based instruction. (See the "Resources" section for adopted health texts.)

Apply the steps for skills-based instruction and support ongoing opportunities to incorporate skills into everyday life

1. Include the five steps of skills-based instruction to effectively build students' health and nutrition skills. (See the "Steps for Skills-based Instruction" chart on the next page.)
2. Plan adequate time to promote students' understanding of essential concepts and to practice skills. The five steps for skill-based instruction are built into some of the Linking Lessons; however extension activities and additional class time are needed to support effective student skill development. Introducing a skill once; or providing a few hours at one grade-level is not enough to support adoption of or maintenance of healthy nutrition behaviors.
3. Continue to model skills, use the steps of goal-setting and decision-making when making class and group decisions and goals. Decide as a class about fruits and vegetables to investigate or taste. Work toward class fruit and vegetable tasting goals.
4. Reinforce skills by catching students reading labels and practicing healthier behaviors (e.g., bringing healthier lunches or trying new foods at school lunch or breakfast).
5. Introduce nutrition case studies and role-plays to check understanding and provide examples of how to apply skills in new contexts.

Steps for Skills-based Instruction

(Joint Committee on National Health Education Standards 2007)

1

Establish Importance and Present the Steps

- Examine the importance of the skill
- Explore the relevance of the skill and its relationship to other skills
- Outline the steps for developing and practicing the skill

2

Model the Skill

- Provide opportunities for students to observe the skill being applied effectively
- Build understanding by providing opportunities for students to ask questions during and after skill modeling

3

Guided Practice

- Furnish step-by-step practice for students to learn and apply the skill
- Give step-by-step coaching and feedback from peers or the teacher
- Provide multiple opportunities for small-group and whole-group check-ins to answer emerging questions and offer solutions

4

Independent Practice

- Provide opportunities for students to practice and apply the complete skill sequence
- Provide opportunities for self-reflection, and peer and teacher coaching
- Provide multiple opportunities for small-group and whole-group check-ins to answer emerging questions and offer solutions

5

Apply to Real-Life Scenarios

- Provide opportunities for students to practice applying the skill set to a variety of real-life scenarios
- Provide reflection opportunities for students to share and explore the pros and cons of different ways to address the scenarios with the skill set
- Encourage students to try new and different skills and strategies to deal with the scenarios
- Provide multiple opportunities for small-group and whole-group check-ins to answer emerging questions and offer solutions

Include a variety of teaching methods

1. When modeling a skill or providing guided or independent practice, include a variety of teaching methods.
2. Emphasize participatory methods that promote cooperation rather than competition. and encourage student engagement by employing the following teaching strategies at any of the steps of skills-based instruction.

Teaching Method	Skills-based Instruction Examples
Class Discussion and Questioning	The teacher or a student poses questions and leads discussions to analyze, clarify, or reach conclusions about the skills learned. For example, the "Nutrition Discussion" sections of the Linking Lessons include different types of questions (e.g., comprehension questions, evaluation questions, and application questions) to check for student understanding of the skill and to guide discussion about how the skill can be applied to real-life situations.
Cooperative or Small Group Activities	The students are members of a problem-solving group in which they collaborate, delegate and share responsibilities, practice communication skills, and support others. For example, the teacher organizes the class into student scientist teams prior to each Linking Lesson investigation. The students agree upon team roles and responsibilities. They work together to complete the investigation and practice skills, such as food safety and analyzing media on cereal boxes. The members provide feedback and support while practicing the skill with the team. (See "Tips for Success – Coordinating Student Scientist Teams," page 9)
Demonstrations	The teacher or a student demonstrates the steps of a skill. For example, the teacher models how to read sections the Nutrition Facts label before student teams investigate the amounts of different compounds in whole and processed foods.
Peer Teaching	The students share information and skills with one another and learn in ways that involve sharing knowledge, ideas, and experience. For example, students work in teams to research how to prevent a variety of chronic diseases. Students learn from one another as they apply the steps for accessing valid and reliable nutrition information and share their findings with the class.
Self-Assessment	The student assesses their understanding of content or their ability to perform a skill. For example, after completing an investigation that includes practice reading the Nutrition Facts label, students assess their ability to apply this skill to choosing healthy snacks.
Writing Assignments	The teacher includes writing activities to help students reflect on skills learned and how they can be applied to daily eating practices. For example, the student lab reports (See "Tips for Success – Coordinating Student Scientist Teams, page 9) include a reflection section for students to describe how they would apply the skills learned to their daily food choices.

Skills-based Health Education Content Standards

The focus in the health education standards is on teaching the skills that enable kindergarten through grade twelve students to make healthy choices and avoid high-risk behaviors. Seven of the eight health standards target essential skills for healthy living; one standard targets the essential knowledge (concepts) for healthy living.

Overarching Health Content Standards

Standards	Description
1 **Essential Health Concepts**	**All students will comprehend essential concepts related to enhancing health.** Understanding essential concepts about the relationships between behavior and health provides the foundation for making informed decisions about health-related behaviors, and for selecting appropriate health products and services.
2 **Analyzing Health Influences**	**All students will demonstrate the ability to analyze internal and external influences that affect health.** Health choices are affected by a variety of influences. The ability to recognize, analyze, and evaluate internal and external influences is essential to protecting and enhancing health.
3 **Accessing Valid Health Information**	**All students will demonstrate the ability to access and analyze health information, products, and services.** Students are exposed to numerous sources of information, products, and services. The ability to access and analyze health information, products, and services provides a foundation for practicing health-enhancing behaviors.
4 **Interpersonal Communication**	**All students will demonstrate the ability to use interpersonal communication skills to enhance health.** Positive relationships support the development of healthy attitudes and behaviors. The ability to appropriately convey and receive information, beliefs, and emotions is a skill that enables students to manage risk, conflict, and differences, and to promote health.
5 **Decision Making**	**All students will demonstrate the ability to use decision-making skills to enhance health.** Managing health behaviors requires critical thinking and problem solving. The ability to use decision-making skills to guide health behaviors fosters a sense of control, and promotes the acceptance of personal responsibility.
6 **Goal Setting**	**All students will demonstrate the ability to use goal-setting skills to enhance health.** The desire to pursue health is an essential component to building healthy habits. The ability to use goal-setting skills enables students to translate health knowledge into personally meaningful health behaviors.
7 **Practicing Health-Enhancing Behaviors**	**All students will demonstrate the ability to practice behaviors that reduce risk and promote health.** Practicing healthy behaviors builds competence and confidence to use learned skills in real-life situations. The ability to adopt health-enhancing behaviors demonstrates students' ability to use knowledge and skills to manage health, and reduce risk-taking behaviors.
8 **Health Promotion**	**All students will demonstrate the ability to promote and support personal, family, and community health.** Personal, family, and community health are interdependent and mutually supporting. The ability to promote the health of oneself and others reflects a well-rounded development and expression of health.

Adapted from the *Health Education Content Standards for California Public Schools, Kindergarten Through Grade Twelve*, adopted by the State Board of Education, March 2008. The full standards can be downloaded from the California Department of Education (CDE) Web site at http://www.cde.ca.gov or purchased from CDE Press, (916) 445-1260.

Assessing Student Learning

The Linking Lessons use a variety of strategies to assess student learning in both science and nutrition. Assessment strategies can be employed before the lesson to determine students' existing knowledge, during the lesson to check for understanding and quickly address needs, and after the lesson to document students' achievement of the learning objectives.

Before the lesson—activate prior knowledge

1. Assess prior knowledge during the pre-activity classroom discussions on the topic.
   - Ask students to share their experiences or what they know about the topic.
   - Use a variety of strategies to assess prior knowledge (e.g., quick write, pair-share, interviewing classmates, graphic organizers, group round-robin discussions).
   - Ask follow-up questions, such as where and when they have learned about the lesson content, what was interesting to them, what did they want to know more about.

During the lesson—check for understanding

1. Start the investigation and conduct a class-wide "thumbs up" or "thumbs down" survey to assess how the first few steps have gone, and to check that the teams are all on track.
2. Circulate from team to team during the activity to check if students are understanding the concepts and skills practice, and to help where needed.
3. Make a mental note of any individual students who may be struggling and might warrant a follow-up or supplementary support.
4. Make announcements to the whole class if something you learned by checking-in with one group, is likely to be useful to all groups.

After the lesson—document achievement of the learning objectives

1. Ask questions to assess how each team completed the investigation.
2. Ask a reporter from each team to share their results and describe what the results mean. Vary what each team is asked to report, and questions they respond to, so all teams have something to contribute.
3. Use a variety of assessment techniques, including paper-pencil tests, essays, projects, reports, and presentations. Additional examples:
   - Self-assessment: Students describe and compare the science and nutrition concepts and skills they knew before the lesson to what they learned in the lesson. They complete a quick write about healthy actions they can take to apply what they've learned.
   - Group assessment: Students evaluate the performance of each team member, and assess how the team worked together. They also identify science and nutrition concepts and skills that they can explain to the class, and describe areas that they would like to learn more about.
   - Whole class assessment: The class evaluates the comprehension level of the group using brief comment cards.
   - Culminating project: Student groups plan and execute a nutrition or activity campaign or community event to share what they have learned. They may use a play, PowerPoint, video presentation, poster, or other multi-media resource.
4. Ask students to write a reflective paragraph on the strengths and weaknesses of the activity, how the team worked together, and what was learned from the activity. A reflection section is included in the student lab report template in "Tips for Success: Coordinating Student Scientist Teams," pages 11-12.

5. Assign extension activities and homework projects that enable students to practice nutrition skills, re-do any portions of the activity needing additional work, and to demonstrate their understanding. Extension ideas are included with the Linking Lessons.
6. Ask students to write assessment questions for a paper-pencil test.
7. Have students create science and nutrition portfolios. Students select and compile nutrition- and science-related investigation reports, writing, and assessment projects. As students review and select examples to add to their portfolios, ask them to describe their selections and reasons for choosing them.
8. After the end of the lesson, and periodically throughout the school year, refer to the investigations and ask the class questions (e.g., How does a previous investigation relate to a new topic?).

Additional Resources

Health Education Assessment Project (HEAP) Series

This set of resources is designed to assess student performance in health. The assessment items and project options can be incorporated into integrated instruction. Although based on the National Health Education Standards, the assessment items can easily be used in conjunction with California's health education content standards (the standards are similar). All materials listed below can be borrowed from the California Healthy Kids Resource Center (Please see the "Resources" section of this document for ordering information, page 227).

- This framework outlines the structure for assessing the essential skills and concepts linked to the National Health Education Standards and the Center for Disease Control, and Prevention's Adolescent Risk Behaviors.

  Assessment Framework: Assessing Health Literacy (#4820)

- These grade-level tools guide student assessment according to health performance standards.

  Assessment Tools for Elementary Teachers (#4821)

  Assessment Tools for Middle School Teachers (#4823)

  Assessment Tools for High School Teachers (#4824)

- A variety of assessment items are provided in these resources, including selected-responses, constructed-responses, and performance-task items.

  Assessment Items: Elementary School (#4825)

  Assessment Items: Middle School (#4826)

  Assessment Items: High School (#4833)

- Samples of student work and examples of scoring are provided for each health education standard.

  Exemplar Responses: Elementary School (#4851)

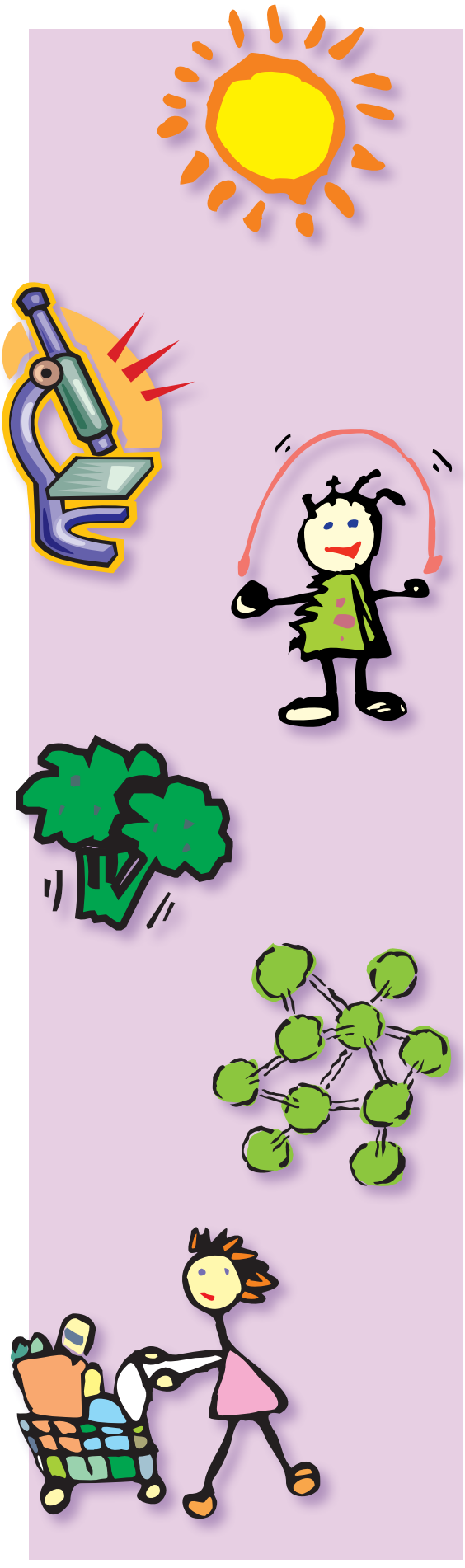
  Exemplar Responses: Middle School (#4853)

  Exemplar Responses: High School (#4888)

- Student handouts, teacher masters, and project options for student performance-based tasks are included in this guide.

  A Guide to Portfolios (#7069)

Linking Lessons



Kindergarten

Linking Lesson 1

Super Senses

Smell is a potent wizard that transports you across thousands of miles and all the years you have lived.

—Helen Keller

Background

Fruits and vegetables contribute essential vitamins, minerals, and fiber that may reduce risk of chronic diseases, help maintain a healthy weight, and keep the digestive system healthy. Many young children do not consume the recommended amounts of fruits and vegetables. A diet low in fruits and vegetables can lead to inadequate levels of vitamins A and C, and dietary fiber, as well as high intakes of total fat and saturated fat.

Recommendations

MyPyramid outlines the daily recommended amounts of fruits and vegetables. Quantities vary for age, level of activity, and gender. General recommendations for children ages four to eight are to consume 1 to 1½ cups of fruits and 1 to 1½ cups of vegetables daily.

How Schools Can Help

Providing opportunities to taste fruits and vegetables can contribute to students' familiarity with, preferences for, and even intake of a variety of fruits and vegetables.

Resource Web Sites

Fruits and Veggies Matter—http://www.fruitsandveggiesmatter.gov
The Centers for Disease Control and Prevention Web site provides benefits, tips, recipes, and recommendations for fruit and vegetable intakes for all ages.

***MyPyramid*—http://www.mypyramid.gov**
This online resource, from the United States Department of Agriculture, features personalized eating plans, interactive tools, classroom materials, posters, brochures, and advice for making food choices from every food group.

Kindergarten

Linking Lesson 1

Super Senses

Activity Overview

Students use their senses to observe characteristics of fruits and vegetables, and then learn about the importance of fruits and vegetables for good health; and how fruits and vegetables can make healthy, delicious snacks.

Science Goal: Students will understand that smell, texture, color, and taste can be used to describe and identify fruits and vegetables.

Nutrition Goal: Students will explain why fruits and vegetables are necessary for good health, and select fruits and vegetables as an option for healthy snacks.

Content Standards and Skills Covered in This Lesson

California Science Standards

Kindergarten

Physical Sciences

1a Students know objects can be described in terms of the materials they are made of (e.g., clay, cloth, paper) and their physical properties (e.g., color, size, shape, weight, texture, flexibility, attraction to magnets, floating, sinking).

Life Sciences

2a Students know how to observe and describe similarities and differences in the appearance and behavior of plants and animals (e.g., seed-bearing plants, birds, fish, and insects).

Investigation and Experimentation

4a Students will observe common objects by using the five senses.

4b Students will describe the properties of common objects.

4e Students will communicate observations orally and through drawings.

California Health Education Standards

Kindergarten

Essential Concepts

1.1.N Name a variety of healthy foods and explain why they are necessary for good health.

1.2.N Identify a variety of healthy snacks.

Practicing Health-Enhancing Behaviors

7.1.N Select nutritious snacks.

Cross-Disciplinary Skills

- Comparing and contrasting
- Evaluating
- Making personal health connections
- Illustrating and communicating

Lesson Highlights

Materials Needed

- ❑ 3 cardboard boxes (e.g., shoe boxes) to create the *Mystery Boxes*
- ❑ 3 opaque containers, with removable covers, for the *Smelling Jars*
- ❑ Display of whole grapes, bananas, oranges, bell peppers, celery, and cucumbers *
- ❑ Copies of student work sheets (one per student)

*Any local, seasonal fruit or vegetable can be used for this lesson. Ask the school nutrition director for produce items for this activity, or contact a local grocery store or produce vendor about donating fruits and vegetables.

Preparation Time

15 minutes

Preparation Activities

- Place **one** fruit or vegetable with a distinctive texture and shape in each *Mystery Box*.
- Place **one** piece of fragrant fruit or vegetable in each *Smelling Jar*.
- Set up three touching and three smelling stations in the room (one station for every three to four students).

Activity Time

65 minutes

This activity can be divided into two class periods:

Steps 1 to 3 (40 minutes) on day one

Steps 4 to 6 (25 minutes) on day two

Vocabulary (See the Glossary for definitions.)

Sight	Taste	Touch
Smell	Texture	

Steps for Classroom Activity

1) Warm-Up (5 minutes)

- Use the *Linking Science and Nutrition* DVD (CHKRC ID #8210) clip, "How Can You Find Out What a Food is if You Cannot See It?" or recruit a student volunteer from the class to be blindfolded and to feel one fruit or vegetable, and smell another fruit or vegetable. Ask the student to guess the fruit or vegetable.
- Could the student in the DVD clip or the student volunteer recognize the fruit or vegetable?
- How did they recognize it?
- After the teacher-led inquiry, summarize the students' theories, and let them know they will be trying to find out what a food is without seeing it.

2) Before the Investigation (15 minutes)

- Introduce the investigation by asking the students to descibe how they use their eyes, nose, ears, fingers, and mouth.
- Tell the students that the eyes, nose, ears, fingers, and mouth are used to sense things around us—they are used to see, smell, hear, touch, and taste.
- Ask the students to name the senses used when they eat. *(Responses may include: taste, smell, sight.)*
- Ask the students to name as many fruits and vegetables as they can. *(List student responses on the board.)*
- Tell the students that today they are going to use only two of the five senses—smell and touch—to try to identify a fruit or vegetable by smell and touch. *(Indicate classroom locations of touching and smelling stations.)*
- Ask the students to describe how they could use the senses of smell or touch to identify the contents of the containers. *(Student responses may include:*
  - *Touch can help identify a fruit or vegetable by its shape, texture, hardness or softness. For example, a potato would feel round, long, rough, and hard. Ask the class for other examples of fruits or vegetables that feel different, such as banana (smooth and long), kiwi (fuzzy), oranges (rough and round), green bean (smooth, slim, and long).*
  - *Smell can also be used to identify a fruit or vegetable. Some fruits and vegetables have a specific scent, such as a strawberry. Ask the class for other examples of fruits or vegetables that have different smells (e.g., apple, banana, watermelon, and broccoli.)*

3) Investigation (15 minutes)

- Distribute the student work sheet, "Super Senses."
- Show the students the display of fruits and vegetables. Ask them to find the first box on their student work sheet, and to circle which fruit or vegetable they predict will be in the touching container, and which will be in the smelling container.
- Have groups of three to four students go to one of the touching and smelling stations.
- Tell the students that, at the stations, they are to close their eyes, and then touch or smell the item.
- Instruct students to circle their guess of what they smelled or touched in the next row on their work sheet.
- Have the students switch stations (e.g., smelling station to the touching station) and repeat the prediction process.

4) Results (5 minutes)

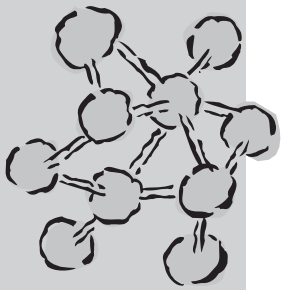
- Ask students to share their guesses for the contents of the containers, and to explain the reasons for their guesses.
- Reveal the fruit or vegetable that is in each container.
- Ask students to raise their hand, if they correctly guessed the contents of the containers:
  - before using the sense of touch or smell
  - after using their senses
- Ask students how their guesses differed, and how their senses helped them correctly identify the mystery fruit or vegetable.
- Have students draw the actual fruit or vegetable they investigated.

5) Nutrition Discussion (10 minutes)

- Ask students to name snacks they like to eat. Ask them to identify which snacks are fruits and vegetables.
- Invite students to add other snacks that include fruits and vegetables, (e.g., apples and yogurt, celery and cream cheese, bananas and peanut butter, carrots and ranch dressing). Write students' responses on a flip chart or board, or post pictures.
- Ask students to select a fruit or vegetable they would like to eat for a snack in the next week, and ask them to draw it on the "My Super Snack" student work sheet."

6) Science Discussion (10 minutes)

- Ask students which sense is used most often to choose the foods they eat.
- Have students orally describe the texture, appearance, smell, and taste of the fruit or vegetable they chose as the snack they would like to eat in the next week.



7) Closing (5 minutes)

- Ask students where fruits and vegetables come from.
- Ask students why fruits and vegetables are healthy snack choices.
- Explain that different parts of plants help the plant stay healthy and grow. Tell students that fruits and vegetables also provide their bodies with important nutrients that are needed to grow, like vitamins and minerals.
- Complete the student assessment the same day or during another class.

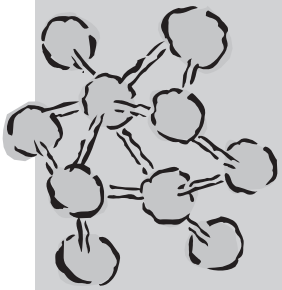
NOTE: This lesson was adapted with permission from *Healthy Foods from Healthy Soils.*

Patten, E. and Lyons, K. 2003. Guess with Gusto! *Healthy Foods from Healthy Soils*. Tilbury House Publishers. Gardner, Maine: 99-101.

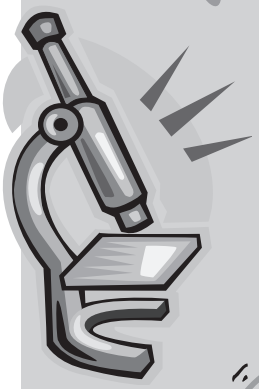
Ideas for Extending the Lesson:

The activities below include resources that are available for a free, four-week loan from the California Healthy Kids Resource Center (CHKRC). Additional nutrition and physical activity DVDs, curricula, references, and displays can also be borrowed. To order materials or obtain other resource suggestions, check the CHKRC Web site at http://www.californiahealthykids.org or call toll free at (888) 318-8188.

Activity	Present the different flavors people are able to taste. Ask students to note which flavors they are sensing when they are tasting different fruits and vegetables. Which flavors do they prefer?	
Resource	*Healthy Foods from Healthy Soils*, Lesson: Taste Buds Rule. (CHKRC ID #7305)	
Standards	**Science** Life Sciences 2a Investigation and Experimentation 4a, b, d, and e	**Health** Essential Concepts Kindergarten: 1.2.N Practicing Health-Enhancing Behaviors Kindergarten: 7.1.N

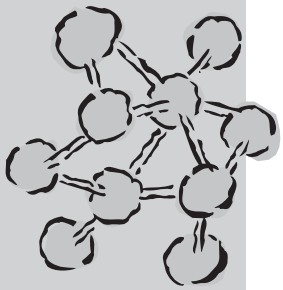


Activity	Create additional mystery boxes and jars of other fruits and vegetables. Ask students to use different senses to determine the mystery fruit or vegetable.	
Resource	*Healthy Foods from Healthy Soils*, Lesson: Guess with Gusto! (CHKRC ID #7305)	
Standards	**Science** Life Sciences 2a Investigation and Experimentation 4a, b, and e	**Health** Essential Concepts Kindergarten: 1.1.N Kindergarten: 1.2.N



Activity	Bring in a fruit or vegetable that the students are not familiar with. Ask them to compare it with a fruit or vegetable they have tried before. Ask students to guess how the fruit or vegetable will taste, smell, feel, and sound.	
Resource	*Healthy Foods from Healthy Soils*, Lesson: Guess with Gusto! (CHKRC ID #7305)	
Standards	**Science** Life Sciences 2a Investigation and Experimentation 4a, b, and e	**Health** Essential Concepts Kindergarten: 1.1.N Kindergarten: 1.2.N

Activity	Provide samples for tasting of the mystery fruit(s) or vegetable(s). Include a variety of different types of the fruit or vegetable for tasting.	
Resource	*Harvest of the Month* (CHKRC ID #5798) or http://www.harvestofthemonth.com, click on the "Monthly Elements" section, and review the suggested taste-testing activities for the featured fruit or vegetable. *Cooking with Kids, Grades K-1* Each unit begins with a tasting activity of a fruit or vegetable. (CHKRC ID #7194) *Kids Cook Farm-Fresh Food* provides directions for conducting comparative tastings. (CHKRC ID #1439)	
Standards	**Science** Life Sciences 2a Investigation and Experimentation 4a and b	**Health** Essential Concepts Kindergarten: 1.1.N Kindergarten: 1.2.N Practicing Health-Enhancing Behaviors Kindergarten: 7.1.N



Activity	Have students create a *My Senses* book that includes one page for each sense, and then have students draw a fruit or vegetable related to each sense. Students can complete this activity for each *Harvest of the Month* fruit or vegetable that they try.	
Resource	*Harvest of the Month* (CHKRC ID #5798) or http://www.harvestofthemonth.com	
Standards	**Science** Life Sciences 2a Investigation and Experimentation 4a, b, d, and e	**Health** Essential Concept Kindergarten: 1.1.N Kindergarten: 1.2.N

Super Senses

Name: _____ Date: _____

Circle your guess before going to the stations in row 1. Then, in row 2, circle your guess after you visit each touch and smell station. Draw the fruit or vegetable in row 3.

		Touch Station	Smell Station
1	My Guess	 Grapes  Celery  Banana	 Cucumber  Orange  Bell Pepper
2	My Guess	 Grapes  Celery  Banana	 Cucumber  Orange  Bell Pepper
3	My Drawing of the Fruit or Vegetable		

My Super Snack

Name: _____ Date: _____

Draw the fruit or vegetable that you would like to have as a snack next week.

My Fruit or Vegetable Snack

Super Senses

Explain to the class that together they are going to track the fruits and vegetables they eat for snacks for three days.

1. Create a large chart as illustrated below. Post the chart in the classroom for tracking the variety of fruits and vegetables that students eat for snacks.

DAY 1	DAY 2	DAY 3
Smell Taste Sight Touch	Smell Taste Sight Touch	Smell Taste Sight Touch

2. Make copies of the form below and distribute one per student as the class settles in each morning. Ask students to draw a fruit or vegetable they ate as a snack the day before.

3. Have students post their fruit or vegetable drawing on the chart created in #1.

4. Each day, ask five to six students to describe their fruit or vegetable using one or two of their senses. Record the students' responses on the chart.

5. At the end of the three days, lead a class discussion of which fruit or vegetable was eaten the most, which sense was used most, how the days differed, and how eating fruits and vegetables for three days could make them healthier.

Kindergarten

Linking Lesson 2

Plant Parts for Breakfast?

Eat food, not to much, mostly plants.

—Michael Pollan

Background

Eating a variety of fruits and vegetables adds new flavors to meals, and is necessary to obtain the recommended amounts of healthful nutrients, such as vitamin A, vitamin C, folate, potassium, and fiber. Choosing different fruits and vegetables, from different color groups and parts of plants contributes to variety. For example, cooked spinach (leaf) and oranges (fruit) are good sources of folate, carrots (root) and cantaloupe (fruit) are good sources of vitamin A, and broccoli (stem) and red peppers (fruit) are good sources of vitamin C.

Recommendations

When choosing fruits and vegetables, the *2005 Dietary Guidelines for Americans,* recommends including whole fruits more often than fruit juices. It also suggests consuming vegetables, each week, from each of the five vegetable sub-groups: dark green (broccoli, spinach, most greens); orange (carrots, sweet potatoes, winter squash, pumpkin); legumes (dry beans, chickpeas, tofu); starchy (corn, white potatoes, green peas); and other (tomatoes, cabbage, celery, cucumber, lettuce, onions, peppers, green beans, cauliflower, mushrooms, and summer squash).

How Schools Can Help

Variety provides many avenues for picky eaters to meet their nutrient needs. A student who does not like carrots won't miss out on vitamin A when cantaloupe or sweet potatoes are included in meals. In addition, regular exposure to different fruits and vegetables introduces students to new tastes, and may increase their intake of a variety of fruits and vegetables.

Resource Web Sites

***2005 Dietary Guidelines for Americans*—http://www.health.gov/dietaryguidelines**
This site includes the full guidelines, which provide research-based advice about how good dietary habits can promote health and reduce risk for major chronic diseases. These guidelines also serve as the basis for federal food and nutrition education programs.

Fruits and Veggies Matter—http://www.fruitsandveggiesmatter.gov
The Centers for Disease Control and Prevention Web site provides benefits, tips, recipes, and recommendations for fruit and vegetable consumption for all ages.

***MyPyramid*—http://www.mypyramid.gov**
This online resource, from the United States Department of Agriculture, features personalized eating plans, interactive tools, classroom materials, posters, brochures, and advice for making food choices from every food group.

Kindergarten

Linking Lesson 2

Plant Parts for Breakfast?

Activity Overview

Students use their senses to observe characteristics of plant parts and then plan a breakfast.

Science Goal: Students will understand that characteristics of plants can be used to identify and categorize foods.

Nutrition Goal: Students will explain why a variety of fruits and vegetables are necessary for good health, and select fruits and vegetables as a healthy breakfast option.

Content Standards and Skills Covered in This Lesson

California Science Content Standards

Kindergarten

Physical Sciences

1a Students know objects can be described in terms of the materials they are made of (e.g., clay, cloth, paper) and their physical properties (e.g., color, size, shape, weight, texture, flexibility, attraction to magnets, floating, sinking).

Life Sciences

2c Students know how to identify major structures of common plants and animals (e.g., stems, leaves, roots, arms, wings, and legs).

Investigation and Experimentation

4a Students will observe common objects by using the five senses.

4b Students will describe the properties of common objects.

4d Students will compare and sort objects by one physical attribute (e.g., color, shape, texture, size, and weight).

4e Students will communicate observations orally and through drawings.

California Health Education Standards

Kindergarten

Essential Concepts:

1.4.N Recognize the importance of a healthy breakfast.

Practicing Health-Enhancing Behaviors

7.2.N Plan a nutritious breakfast.

Cross-Disciplinary Skills

- Comparing and contrasting
- Evaluating
- Making personal health connections
- Illustrating and communicating

Lesson Highlights

Materials Needed

- ❑ 1 brown bag with all five different types of food plant parts: carrot or potato (root); lettuce or cabbage (leaf); celery or green onion (stem); orange or apple (fruit), rice, cereal, or bread (seed).
- ❑ 5 to 6 brown paper bags (lunch bags), one for each student team
- ❑ 5 different types of food plant parts (one type of plant part for each student team)*
- ❑ Copies of student work sheet and student assessment (one per student)
- ❑ Prepare "Plant Part Cards" (one card per student)

*To prepare for this lesson, ask the school food services director or contact a local grocery store or produce vendor to request a donation of fruits and vegetables for the activity.

Preparation Time

15 minutes

Preparation Activities

- Place five food items that represent each of the plant parts into one brown bag.
- Place <u>one</u> food item representing one plant part in one brown bag. Label each bag as *Team 1, Team 2, Team 3, Team 4,* and *Team 5*. Include one plant part in each bag as follows: Team 1 (wheat–seed), Team 2 (sweet potato–root), Team 3 (broccoli–stem), Team 4 (strawberry–fruit), Team 5 (parsley–leaf).
- Make "Plant Part Cards" (one per student).
- Copies of student work sheets (one per student).

Activity Time

60 minutes

This activity can be divided into two class periods:

Steps 1 to 3 (35 minutes) on day one
Steps 4 to 6 (25 minutes) on day two

Vocabulary (See the Glossary for definitions.)

Flower	Leaf	Seed
Fruit	Root	Stem

Steps for Classroom Activity

1) Warm-Up (5 minutes)

- Hold up the paper bag that contains the foods representing all the plant parts. Announce to the students that this bag contains breakfast foods, and that each student team will be given a breakfast bag.
- Let students know that the bag includes only plant parts. Ask them what breakfast choices come from plants and how they could identify which plant part it is.
- After the teacher-led inquiry, summarize the students' theories and let them know they will be trying out some ways to identify plant parts that are food.

2) Before the Investigation (15 minutes)

- Introduce the investigation by asking the students to name the parts of the plant.
- Refer to the "Plant Part" diagram in this lesson or a poster of a plant from a science or nutrition resource. As students name the plant parts, label them on the diagram or poster.
- Ask students to describe what each part does for the plant. *(Responses may include: Leaves make energy for the plant; roots get water and nutrients from the soil; the stems support the plant and take the nutrients to the leaves; and flowers, fruits, and seeds make new plants.)*
- Distribute the "Plant Part Cards," and ask students to form groups of six students with different plant part cards so they will form an entire plant.
- While in their "plant groups," ask the students to study the plant part on their card and describe the characteristics of each plant part. As students provide descriptions, write the characteristics of the plant parts on the poster or diagram. *(For example: roots are long and round; stems can be long, green, and flexible; leaves are thin, flat, and usually green; fruit has a peel and seeds; flowers are brightly colored and have many petals, seeds are small and hard.)*
- Have students keep their "Plant Part Cards" and go back to their seats.
- Show the students the brown bag that contains the five food items. Explain that this bag contains all the items eaten for breakfast. Take out each plant part and explain how each was a part of breakfast. Ask students to identify the plant part the food item came from. *(Provide examples for students: a "plant part breakfast" may include hash brown potatoes [root] with green onion [stem], an egg with basil [leaf], whole wheat toast [seed], and sliced*

oranges [fruit], and a flower on the table to brighten the day. Remind the class that not all plants and plant parts can be eaten; some plants and parts of plants are poisonous. They should check with a trusted adult before eating something new.)

- Tell the students that today they will work in teams. Each team will be given a brown bag with a plant part to identify.

3) Investigation (15 minutes)

- Form student teams and distribute the student work sheet, "Plant Parts for Breakfast?"
- Give each student team a brown bag with one plant part food item.
- Instruct the team to work together to determine what part of the plant the food item represents and complete parts 1 and 2 of the student work sheet.
- Ask each student team to choose a reporter. The student reporter will share the team's results with the class. The reporter will show the class the food item in the team's brown bag, share the team's results, and describe how the team determined the type of plant part.

4) Results (10 minutes)

- Ask the student reporter to share the team's results with the class.
- As each team presents, ask the class to agree or disagree with the results. *(Request that students hold their thumbs up if they agree and thumbs down if they disagree.)* Ask students to respectfully suggest other conclusions when they disagree.
- Review the correct results with the class.

5) Nutrition Discussion (5 minutes)

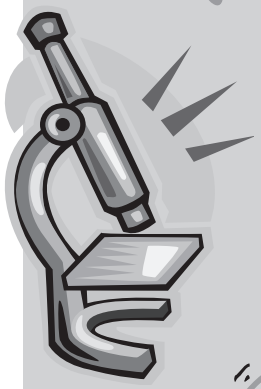
- Ask students for examples of breakfast items they eat. Write the breakfast items on the board.
- Ask the class which breakfast items are from plants.
- Label each breakfast item with "plant," as the class identifies it as a plant-based breakfast choice.

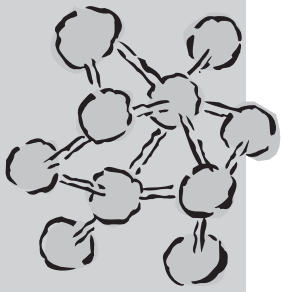
6) Science Discussion (5 minutes)

- Ask students to review the breakfast items listed on the board. Which plant part is most often eaten for breakfast?
- Ask students to return to their "Plant Parts for Breakfast?" student work sheet and complete part 3 by circling another food item that is from the plant part their team investigated.
- Have students orally describe the texture, appearance, smell, and taste of the breakfast item they circled on their work sheet.

7) Closing (5 minutes)

- Ask students why fruits and vegetables from plants are healthy breakfast choices.





- Remind the students that different parts of plants help the plant stay healthy and grow. Tell students that eating breakfast helps them learn, and that including a variety of fruits and vegetables also helps them stay healthy and grow.
- Ask students to select a plant part that they would like to eat for breakfast in the next week, and ask them to draw it in part 4 of their "Plant Parts for Breakfast?" student work sheet.
- Complete the student assessment at the close of class or on another day.

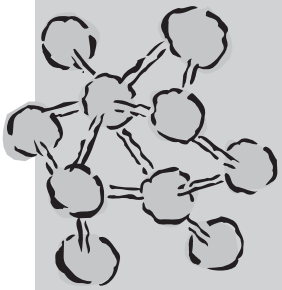
NOTE: This lesson was adapted with permission from *Healthy Foods from Healthy Soils.*

Patten, E. and Lyons, K. 2003. Bark and Seeds for Breakfast. *Healthy Foods from Healthy Soils*. Tilbury House Publishers. Gardner, Maine: 21-24.

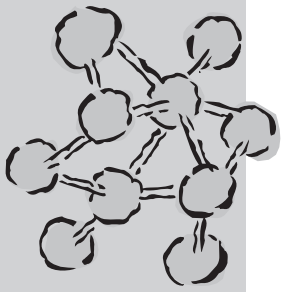
Ideas for Extending the Lesson:

The activities listed below include resources that are available for a free, four-week loan from the California Healthy Kids Resource Center (CHKRC). Additional nutrition and physical activity DVDs, curricula, references, and displays can also be borrowed. To order materials or obtain other resource suggestions, check the CHKRC Web site at http://www.californiahealthykids.org or call toll free at (888) 318-8188.

Activity	Bring in a fruit or vegetable plant part that the students may not be familiar with. Ask students to use the characteristics of plant parts to determine the plant part of the fruit or vegetable. Ask students to guess how the fruit or vegetable will taste, smell, feel, and sound.	
Resource	*Healthy Foods from Healthy Soils,* Lesson: Guess with Gusto! (CHKRC ID #7305)	
Standards	**Science** Life Sciences 2a Life Sciences 2c Investigation and Experimentation 4a, b, d, and e	**Health** Essential Concepts Kindergarten: 1.1.N

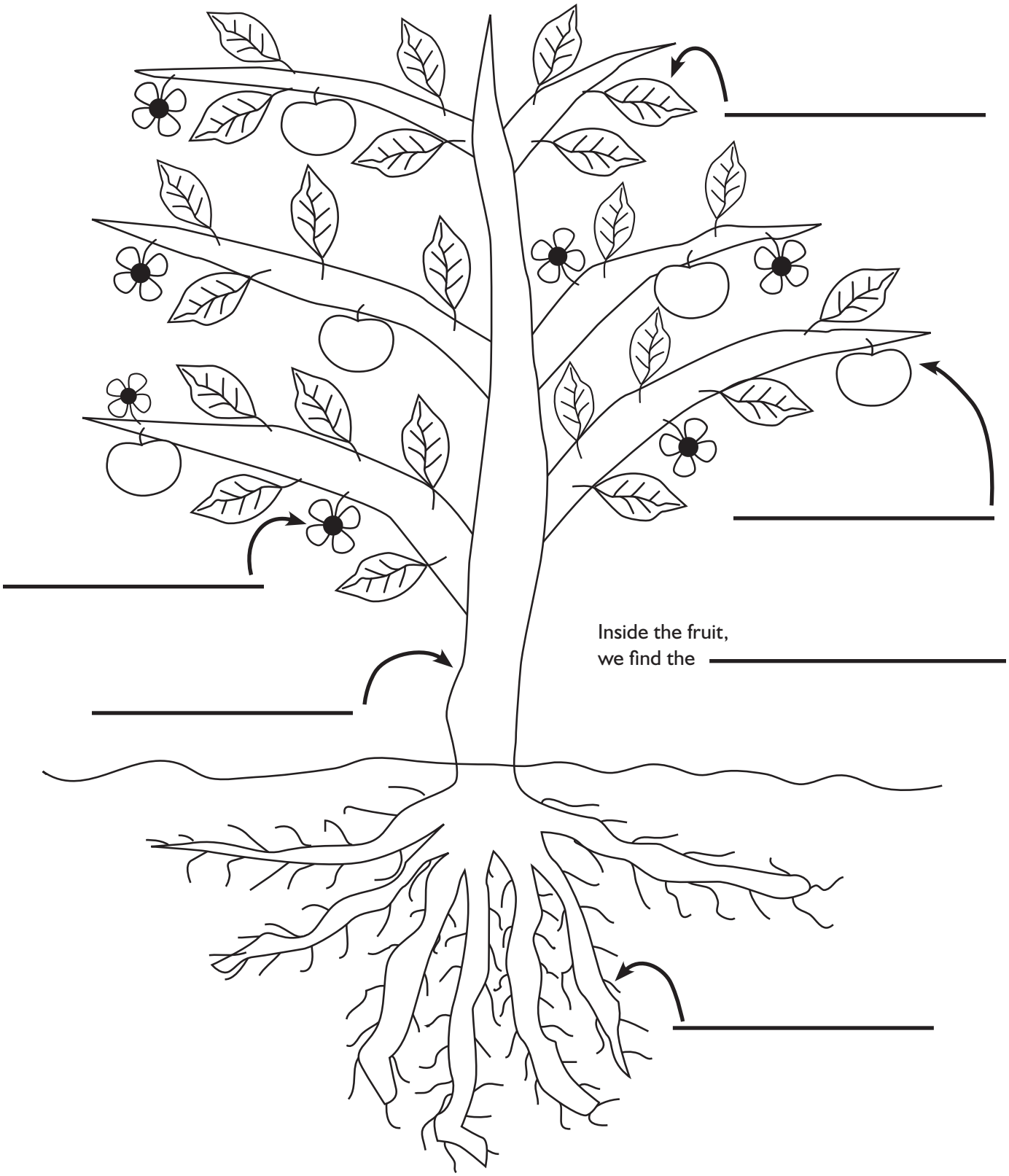


Activity	Create a bulletin board with an illustration of a plant with the parts labeled. One day each week, have students draw a food they ate for breakfast that comes from a plant. Post the pictures of the foods next to the plant part they represent. "Grow" a list of healthy breakfast items that are from plants.	
Resource	*Healthy Foods from Healthy Soils*, Lesson: Bark and Seeds for Breakfast. (CHKRC ID #7305)	
Standards	**Science** Life Sciences 2c Investigation and Experimentation 4a, b, d, and e	**Health** Essential Concepts Kindergarten: 1.1.N Kindergarten: 1.4.N



Activity	Provide tasting samples of fruit and vegetable plant parts. Include a variety of different types of the fruit or vegetable for tasting. Discuss how the items tasted could be included in a healthy breakfast.	
Resource 3	*Harvest of the Month* (CHKRC ID #5798) or http://www.harvestofthemonth.com. Click on the "Monthly Elements" section, and review the taste-testing activities for the featured fruit or vegetable. *Cooking with Kids, Grades K-1* Each unit begins with a tasting activity of a fruit or vegetable. (CHKRC ID #7194) *Kids Cook Farm-Fresh Food* provides direction for conducting comparative tastings. (CHKRC ID #1439)	
Standards	**Science** Investigation and Experimentation 4a, b, d, and e	**Health** Essential Concepts Kindergarten: 1.1.N Kindergarten: 1.4.N Practicing Health-Enhancing Behaviors Kindergarten: 7.2.N

Plant Part Diagram



Plant Part Cards

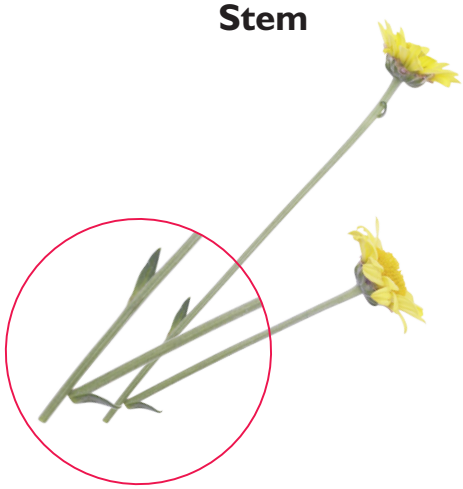
Flower

Fruit

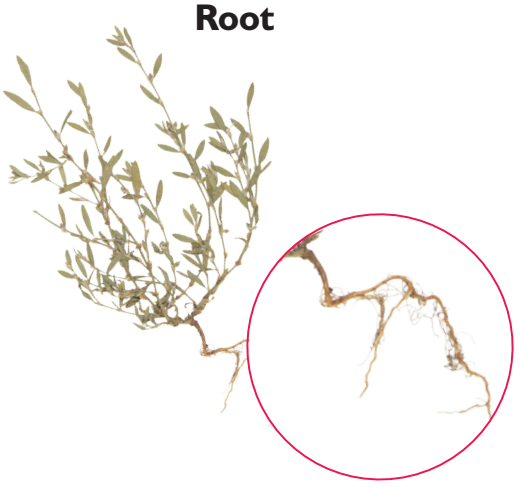
Seed

Leaf

Stem



Root

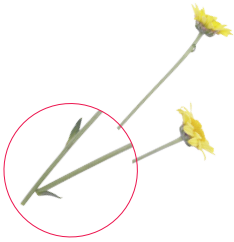


Plant Parts for Breakfast?

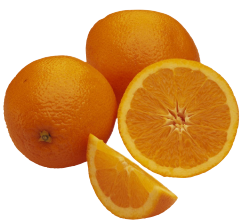
Name:_____

1. Draw the plant part in the team's breakfast bag.

2. Circle the part of the plant the breakfast bag item comes from:

Root	Stem	Leaf	Fruit	Seed
				

3. Circle one other breakfast item that comes from your team's plant part:

Celery	Orange	Parsley	Peanut Butter	Muffin
				

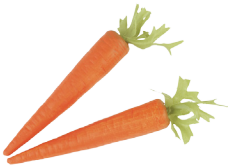
4. Draw the plant part you would like to eat for breakfast:

My Plant Part Breakfast

Plan a Plant Part Breakfast for Your Family!

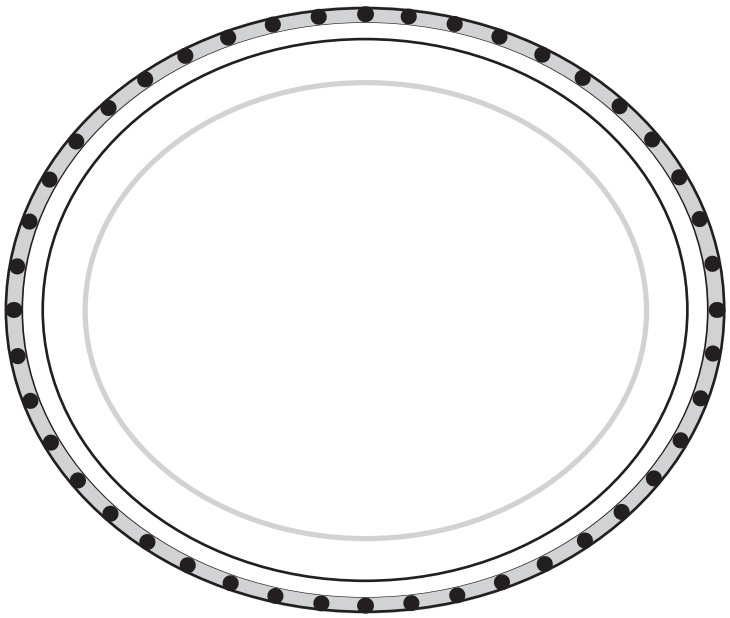
Name:_____

1. Match the foods to the plant parts:

Plant Parts	Foods
ROOT 	
FRUIT 	
SEED 	

2. Choose one or two of the plant parts from above to make a family breakfast. Draw the breakfast on the plate below:

My Family Plant Part Breakfast



Is This a Healthy Attraction?

Ads may try to convince your child that having a certain toy or eating a certain food will make them happy or popular. Kids need to know that ads try to convince people to buy things they may not need.

—American Academy of Pediatrics

Background

Young people view thousands of advertisements every year, and many of these are for food. Marketers know that children have considerable purchase influence, and can successfully negotiate purchases through what marketers term the "nag factor" or "pester power." Companies target promotions such as premiums, sampling, coupons, contests, and packaging for children. The most requested in-store request is breakfast cereal.

Recommendations

To minimize children's exposure to television advertising, *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity,* and the American Academy of Pediatrics, recommend that children two years and older be limited to no more than one to two hours per day of television, and that they be high-quality educational shows. In addition, they recommend that children younger than two years of age be discouraged from viewing television.

How Schools Can Help

Media education can be an effective deterrent to some of the negative effects of advertising. Media literacy activities, such as this lesson, can be used to teach students to become more critical of media in all of its forms, including television and packaging advertising.

Resource Web Sites

***The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*—http://www.surgeongeneral.gov/topics/obesity**
This site includes reports and fact sheets about preventing overweight in children and adolescents.

Center for Media Literacy—http://www.medialit.org
This site provides leadership, public education, professional development, and educational resources to promote and support media-literacy education.

Grade Two

Linking Lesson 3

Is This a Healthy Attraction?

Activity Overview

Student teams investigate methods of attraction used by flowers, fruits, and popular cereals. Then students learn about the importance of a healthy breakfast, and brainstorm healthy breakfast choices that include fruits.

Science Goal: Students will be able to identify common pollinators and explain what attracts pollinators to plants and flowers.

Nutrition Goal: Students will understand that product packaging can influence their food choices. They will also be able to explain the importance of eating a healthy breakfast, and identify fruit as a healthy breakfast option.

Content Standards and Skills Covered in This Lesson

California Science Standards

Grade Two

Life Sciences

2f Students know flowers and fruits are associated with reproduction in plants.

Investigation and Experimentation

4c Students will compare and sort common objects according to two or more physical attributes (e.g., color, shape, texture, size, weight).

California Health Education Standards

Grade Two

Essential Concepts

1.3.N Discuss the benefits of eating a nutritious breakfast every day.

Analyzing Influences

2.1.N Discuss how family, friends, and media influence food choices.

Practicing Health-Enhancing Behaviors

7.1.N Examine the importance of eating a nutritious breakfast every day.

Cross-Disciplinary Skills

- Observing
- Comparing and categorizing
- Accessing accurate information
- Recording and collecting data
- Making personal health connections
- Communicating research

Lesson Highlights

Materials Needed

- ❑ Photo of bees pollinating flowers
- ❑ A diagram of plant parts (See *Linking Lesson 2*, Plant Parts Diagram)
- ❑ Fragrant and colorful flowers and fruits—such as roses, lilacs, and apples, strawberries, oranges—one flower or fruit for each student team*
- ❑ Empty cereal boxes, one box per student team—include examples that are the same serving size, include decorative and plain packaging, and those that are high and low in sugar
- ❑ Copies of student work sheet (one per student)
- ❑ Plain paper with the "Concept Map" diagram
- ❑ Plain paper with class summary charts

*To prepare for this lesson, flowers, fruit, and cereal boxes can be brought by students, or donated from the school cafeteria or a local grocery store.

Preparation Time

20 minutes

Preparation Activities

- Gather materials for the activity.
- Copy student work sheets.
- Make class summary charts.

Activity Time

80 minutes

This activity can be divided into two class periods:

Steps 1 to 3 (35 minutes) on day one
Steps 4 to 7 (45 minutes) on day two

Vocabulary (See the Glossary for definitions.)

Advertise	Flower	Seed
Attract	Fruit	Sugar
Color	Pattern	
Disperse	Pollinate	

Steps for Classroom Activity

1) Warm-Up (5 minutes)

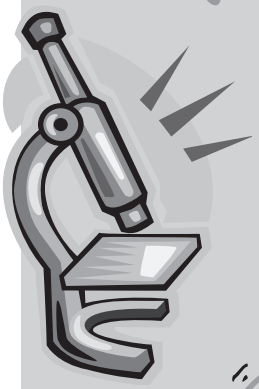
- Show the *Linking Science and Nutrition* DVD (CHKRC ID #8210) clip entitled, "How Do Bees Find Flowers?" or a photo of bees pollinating flowers.
- Ask students how bees find flowers.
- After completing the teacher-led inquiry, summarize the students' theories about how bees find flowers *(Students' theories may include that bees are attracted to flowers by color, scent, and patterns)*.

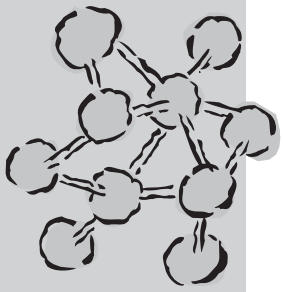
2) Before the Investigation (15 minutes)

- Post a diagram of plant parts, and ask students to name the parts of the plant. *(Responses may include: flower, fruit, seed, stem, leaf, and root.)*
- Review how plants are pollinated and seeds are dispersed. *(Flowers and fruits attract insects and animals to pollinate them and scatter their seeds. Birds and bees are common pollinators, both have color vision and are attracted to "colorful" flowers. Flowers also attract pollinators by scent. Fruits attract animals by color and scent so that animals eat them and help disperse the seeds.)*
- Tell students that, like flowers and fruits, makers of foods (like cereal) also try to find ways to attract people to their product.
- Display two cereal boxes (one box should be very decorative and the other plain). Ask the students which they prefer and why. *(List student responses on the board.)*
- Display two flowers (one attractive and one plain). Ask the students which they prefer, and why. *(List student responses on the board.)*
- Display the "Concept Map" and ask students to describe what attraction is. Summarize their responses on the map.
- Tell the students that today they will form teams to investigate and compare the methods of attraction used by flowers, fruits, and cereal boxes.

3) Investigation (15 minutes)

- Divide the class into student scientist teams. Include no more than five students per team. (See "Tips for Success: Coordinating Student Scientist Teams," page 9.)





- Distribute the student work sheet, "Flower, Fruit, and Cereal Observation."
- Give each student team a flower or fruit, and an empty box of cereal.
- Instruct the students to carefully observe the fruit or flower and the cereal box, and to note the team's observations. Student team members should share their notes with the data recorder.

4) Results (15 minutes)

- Use the "Flower or Fruit Observation Results" chart and the "Cereal Box Observation Results" chart included in this section to make an overhead or large chart to record the class results.
- Briefly demonstrate how to share a team's results. Record the sample on the overhead or chart.
- Ask each data reporter to briefly share their team's results. Record each team's results on the class summary charts.
- Discuss how the flowers, fruits, and cereal boxes were alike and different in their methods of attraction.

5) Nutrition Discussion (15 minutes)

- Ask the class to suggest reasons for making cereal boxes attractive.
- Explain that some companies include attractive packaging so people or children will buy their products. Some of the brightest packaging is for cereal with extra sugars added.
- Tell students that sugars provide quick energy, and very few vitamins or minerals. Sugars occur naturally in many foods, such as milk and fruit, and can also be added to foods during processing and preparation (e.g., candy, cereals, and soda). Most people, including children, should not eat too much sugar; it can promote tooth decay and possibly contribute to other health problems.
- Show the students the Nutrition Facts label on the side of the cereal box, and inform students that this label tells how much sugar is in one serving of cereal. Demonstrate how to find the amount of sugar on the label.
- Ask student data reporters to find this label on the team's cereal box, and to read the amount of sugar on the label. Record the name of the cereal and the amount of sugar on the board.
- Ask students to identify which cereal has the most sugar and the least sugar.
- Ask students to choose which is healthier for breakfast, a high-sugar cereal or a piece of fresh fruit?
- Tell students that eating a healthy breakfast is important because it helps them concentrate and do better in school. A healthy breakfast includes a variety of foods from several of the food groups.
- Have students name fruits they could eat instead of high-sugar cereals or other less healthy foods for breakfast. *(List student responses on the board.)*

Sample Healthy Breakfasts with Fruits

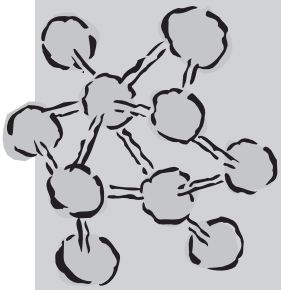
- Cereal with strawberries, bananas, blueberries, raspberries, etc.
- Yogurt with fruit or granola
- Peanut butter on a whole-grain bagel and orange juice
- Oatmeal with raisins or berries
- A smoothie (made of fruit and milk)
- A hard-boiled egg and juice
- Cottage cheese and peaches

6) Science Discussion (5 minutes)

- Ask students to name other insects and animals that help pollinate plants and disperse seeds. *(Responses may include: Butterflies, moths, beetles, bats, flies, deer, bear, squirrels, birds, humans, and many other animals help with seed dispersal.)*
- Ask students why it is important that insects and animals are attracted to flowers and fruits. *(Responses may include: It is important for plants to successfully attract insects and animals in order to continue to create fruit for us to eat and to produce new plants.)*

7) Closing (10 minutes)

- Refer to the "Concept Map."
- Ask students what they discovered about attraction. *(Record their discoveries on the "Concept Map.")*
- Ask student teams to summarize how color, shape, and smell were methods of attraction in their investigation of the fruit or flower. *(Record their summaries on the "Concept Map.")*
- Ask other student teams to summarize how color, shape, and smell were methods of attraction in their investigation of the cereal box. *(Record their summaries on the "Concept Map.")*
- Discuss how the flowers, fruits, and cereal boxes were alike and different in their methods of attraction. *(Responses may include: 1) Similarities—flowers, fruit, and cereal boxes use color, smell, patterns, and taste for attraction; some of the same methods of attraction work for insects and people, and 2) Differences—flowers and fruits use attraction for pollination and seed dispersal, and cereal companies use it to attract people to buy their food.)*
- Summarize the students' ideas about similarities and differences. Remind students that they can check whether an attraction to cereal is healthy by checking the Nutrition Facts label or asking a teacher, parent, or other trusted adult to help them find out how healthful it is.
- Complete the student assessment as a class assignment or on another day.



Ideas for Extending the Lesson

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1

Activity	Discuss with students what or who affects what they eat (e.g., parents, grandparents, siblings, friends, TV, seasons, weather, health information and nutrition labels, packaging), and which are healthy influences.	
Resource	*Health and Fitness*—Grade 2, Lesson 4: Ads Affect Food Choices. (CHKRC ID #7265)	
Standards	**Science**	**Health** Analyzing Influences Grade 2: 2.1.N

2

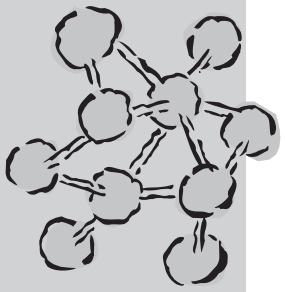
Activity	Have each student make a diary to chart the fruits and vegetables they eat for breakfast in one week. After a week, have students share how they did. Ask students to describe what helped them eat more fruits and vegetables, and how eating fruits and vegetables can help them stay healthy.	
Resource	*MyPyramid for Kids Classroom Materials*—Grades 1 and 2, Lesson 3: Vary Your Veggies and Focus on Fruits (CHKRC ID #7599)	
Standards	**Science**	**Health** Essential Concepts Grade 2: 1.3.N Analyzing Influences Grade 2: 2.1.N

3

Activity	Have students plan a breakfast that includes a *Harvest of the Month* fruit or vegetable. Ask them to write a few sentences about why eating breakfast is important, and why this would be a nutritious meal.	
Resource	*Harvest of the Month* (CHKRC ID #5798) or http://www.harvestofthemonth.com	
Standards	**Science**	**Health** Practicing Health-Enhancing Behaviors Grade 2: 7.1.N Grade 2: 7.2.N

4

Activity	Have students research pollinators, and find out which use their sight, and which use their sense of smell. What plants are pollinated by which pollinators? How does this help provide fruits and vegetables for breakfast?	
Resource	*Project Food, Land, and People*—Lesson: Buzzy, Buzzy Bee (CHKRC ID #5497—English, and #5500—Spanish)	
Standards	**Science** Life Sciences 2f	**Health**



Flower, Fruit, and Cereal
Observation

Name:_____ Date:_____

Names of Student Scientist Team Members:_____

_____

Flower or Fruit	**Cereal**
Name of Flower of Fruit	Name of Cereal
WHAT DO YOU SEE? How many colors are on the flower or fruit?_____ What are they? Are the colors bright? ☐ Yes ☐ No What shape is it? Draw a picture of it below.	WHAT DO YOU SEE? How many colors are on the box?_____ What are they? Are the colors bright? ☐ Yes ☐ No What pictures are on the box? Do the pictures draw your attention? ☐ Yes ☐ No What words are on the box? Are there any special toys on the box? ☐ Yes ☐ No List any special toys below:
WHAT DO YOU SMELL? Does it smell sweet? ☐ Yes ☐ No Does it smell good? ☐ Yes ☐ No Does it smell strong or faint?_____	HOW DO YOU THINK THE CEREAL SMELLS? Would it smell sweet? ☐ Yes ☐ No Would it smell good? ☐ Yes ☐ No Would it smell strong or faint?_____
ANY OTHER OBSERVATIONS? Do you like this flower or fruit? ☐ Yes ☐ No Why do you like or dislike it?	ANY OTHER OBSERVATIONS? Would you eat this cereal? ☐ Yes ☐ No Why would you eat or not eat this cereal?

Flower or Fruit Observation Results

Team	1	2	3	4	5	6
Flower or Fruit	Rose					
Color(s)	Red					
Shape or Box Design	Cup					
Smell	Sweet, Good					
Smell Strong or faint	Strong					
Other Observations						
Like it?	Yes					
Reasons	Smells good Like the color					

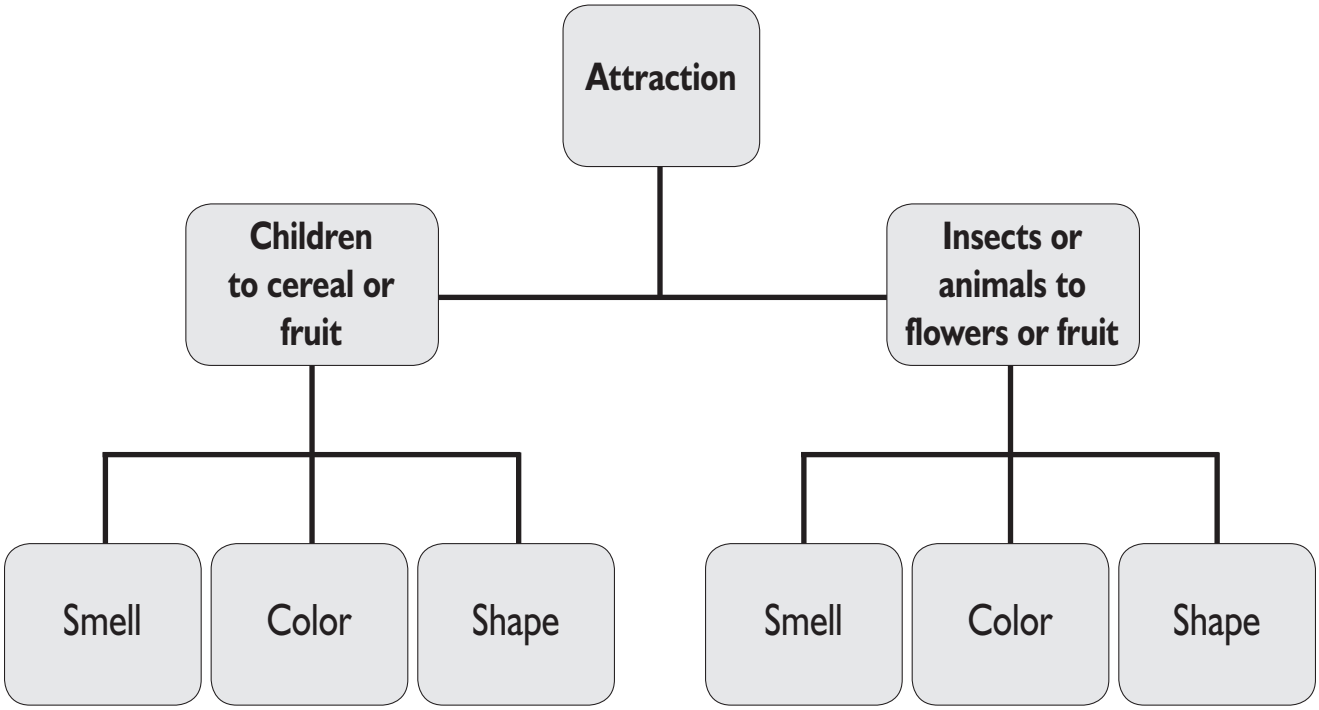
Cereal Box Observation Results

Team	1	2	3	4	5	6
Cereal Box	Sugar Puffs					
Color(s)	Red Yellow Bright colors					
Box Design	Cartoon dog					
Smell	Sweet					
Smell Strong or faint	Strong					
Other Observations	Toy inside					
Like it?	Yes					
Reasons	Smells good Like the color Want the toy					

Is This a Healthy Attraction?
Concept Map

Concept mapping can be used to illustrate the relationships between different concepts. Use a white board or poster paper to create a concept map to summarize the characteristics that may attract children to cereals or fruits, and that may attract insects to flowers or fruits.

1. Write the students' definition of attraction.
2. Write the students' observations about how insects are attracted to flowers and fruits.
3. Note each team's responses regarding how color, smell, and shape or pattern might attract them to a cereal or fruit.
4. Discuss the similarities and differences.



Attract Kids to Eat Fruit at Breakfast!

Overview

Students work in groups to demonstrate their understanding of attraction factors that influence food choices. Students also demonstrate their understanding of the health benefits of eating breakfast and the fruit they select to market.

Directions

Each group pretends they were hired by an advertising agency to create a package to attract other students to eat fresh fruits for breakfast. Allow each group to choose one fruit they plan to market. Ask groups to include the following in their packaging:

- Color and design that may influence children's food choice.
- Why eating fruit at breakfast is a healthy choice.
- A cover sheet that briefly describes why they selected that fruit, how their packaging tries to attract children to eat the fruit at breakfast, and how eating fruit helps students become healthier.

Materials

- Sources of information about fruit
- Sample advertisements and packages
- Photos of fruits
- Paper
- Poster board
- Marking pens
- Crayons
- Colored pencils

Time

Provide time in class or as a homework assignment. After each student team turns in their package, review it based on their understanding of the health benefits of fruit and eating breakfast, and how well they describe the methods used to influence food choice.

References for Information About Fruit

- *Fresh Fruit and Vegetable Photo Cards* (CHKRC ID #6890)
- *Harvest of the Month* (CHKRC ID #6798) or http://www.harvestofthemonth.com

Grade Four

Linking Lesson 4

Whole or Processed: Which is Better for Me?

The more the food is processed the fewer nutrients it contains . . . it dilutes the remaining nutrients by adding cheap fillers such as water, fats, starches, and sugars.

—Joan Gussow

Background

Many factors influence student food choices, including method of preparation, advertising, taste, peers, family, and even its impact on health. An important health consideration is the effect of food processing. When compared with refined or processed foods (e.g., white bread, pre-packaged and convenience foods), selecting more whole foods (e.g., whole grains, fresh vegetables and fruits, and legumes) increases fiber intake and reduces dietary fat and sodium. Eating more fresh foods and whole grains contributes to decreased risk of cancer and cardiovascular disease, and improved digestive system function.

Recommendations

The 2005 Dietary Guidelines for Americans recommends including more whole grains, fresh fruits, and vegetables. These are a few of the whole food recommendations for adults and children above the age of two:

- Choose a variety of fruits and vegetables each day; include all five vegetable subgroups (dark green, orange, legumes, starchy vegetables, and other vegetables) several times a week.
- In general, at least half the grains, breads, and cereals eaten each day should come from whole grains.
- Choose fiber-rich fruits, vegetables, and whole grains often.
- Consume less than 2,300 milligrams of sodium (approximately one teaspoon of salt) each day.
- Choose and prepare foods with little salt. Consume potassium-rich foods, such as fruits and vegetables.

How Schools Can Help

Nutrition education provides students with instruction and opportunities to compare the nutrient and sugar content of familiar processed and whole foods. Students who learn to read food labels, can use this information to make decisions that can increase their intake of whole and fresh foods.

Resource Web Sites

***2005 Dietary Guidelines for Americans*—http://www.health.gov/dietaryguidelines**
This site includes the full guidelines, which provide research-based advice about how good dietary habits can promote health and reduce the risk for major chronic diseases. They also serve as the basis for federal food and nutrition education programs.

Fruits and Veggies Matter—http://www.fruitsandveggiesmatter.gov
The Centers for Disease Control and Prevention Web site provides benefits, tips, recipes, and recommendations for fruit and vegetable intakes for all ages.

***Harvest of the Month*—http://www.harvestofthemonth.com**
The *Network for a Healthy California* Web site provides nutrition and gardening information about fresh California produce, as well as newsletters for educators, parents, and food service professionals.

Life Lab—http://www.lifelab.org
This link provides additional information, resources, and professional development opportunities for using gardens to teach nutrition.

***MyPyramid*—http://www.mypyramid.gov**
This online resource, from the United States Department of Agriculture, features personalized eating plans, interactive tools, classroom materials, posters, brochures, and advice for making food choices from every food group.

National Gardening Association—http://www.kidsgardening.com
This online resource includes materials and trainings for learning about gardening, and fresh fruits and vegetables.

Grade Four

Linking Lesson 4

Whole or Processed: Which is Better for Me?

Activity Overview

Student teams learn about the difference between whole and processed plant foods and then predict, compare, and contrast the nutrients in whole versus processed forms of foods by reading and interpreting food labels.

Science Goal: Students will understand that humans need energy to live and grow, and that the energy comes from plants and the calories in the foods that we eat.

Nutrition Goal: Students will be able to describe the difference between whole foods and processed foods, including why whole foods are a healthier option.

Content Standards and Skills Covered in This Lesson

California Science Standards

Grade Four

Life Sciences

2a Students know plants are the primary source of matter and energy entering most food chains.

Investigation and Experimentation

6a Students will differentiate observation from inference (interpretation) and know scientists' explanations come partly from what they observe, and partly from how they interpret their observations.

6c Students will formulate and justify predictions based on cause and effect relationships.

6e Students will construct and interpret graphs from measurements.

California Health Education Standards

Grade Four

Essential Concepts

1.1.N Identify and define key nutrients and their functions.

Accessing Valid Information

3.2.N Use food labels to determine nutrient and sugar content.

Goal Setting

6.1.N Make a plan to choose healthy foods and beverages.

Cross-Disciplinary Skills

- Predicting outcomes
- Categorizing
- Communicating results

Lesson Highlights

Materials Needed

- ❑ Video clip "Why Does the Apple Float and the Apple Pie Sink?" from *Linking Science and Nutrition* DVD (CHKRC ID #8210) or demonstrate using a clear container of water, an apple, and a snack apple pie
- ❑ For each student team, include one fresh fruit or vegetable, one corresponding processed food item, and food labels for each item. Suggestions:
  - Fresh fruits and vegetables: tomato, orange, apple, potato, and corn. Food labels are included in this lesson. Additional food labels are on the *Harvest of the Month* Web site.
  - Processed foods: canned tomato soup, orange soda, snack apple pie, potato chips, and corn chips. Be sure a food label is on each item.
- ❑ Student work sheets (one per student)
- ❑ Poster or transparency of Nutrition Facts label
- ❑ Flip chart or transparency to summarize class results

Preparation Time

30 minutes

Preparation Activities

- Display sets of fresh and processed foods with their Nutrition Facts labels.
- Copy student work sheets.
- Make class results charts.

Activity Time

85 minutes

This activity can be divided into two class periods:

Steps 1 to 3 (40 minutes) on day one
Steps 4 to 7 (45 minutes) on day two

Vocabulary (See the Glossary for definitions.)

Calories	Grams	Total fat
Carbohydrate	Processed food	Whole food
Energy	Sodium	

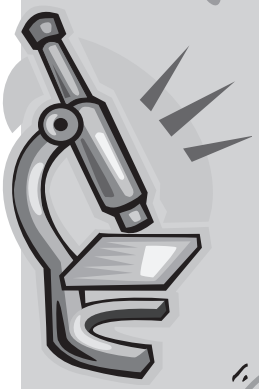
Steps for Classroom Activity

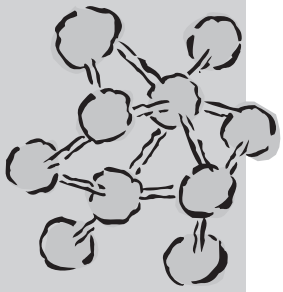
1) Warm-Up (5 minutes)

- Show the *Linking Science and Nutrition* DVD video clip entitled, "Why Does the Apple Float and the Apple Pie Sink?" The video shows an apple and an apple pie that are dropped into a clear water tank. Optional: If conducting this demonstration for the class, make sure to pierce both the pie and the apple with a fork four times each before dropping in the water.
- Conduct a teacher-led inquiry about why the apple floats, while the apple pie sinks. During the discussion, record the students' questions and theories.

2) Before the Investigation (20 minutes)

- Review and summarize the students' theories. Circle one that is most related to the theory that the apple pie sinks because it includes added ingredients.
- Ask the students to compare the similarities and differences of the apple and apple pie. Show students the other fresh and processed foods on display, and discuss how they are similar and different.
- Summarize that an apple, an orange, and a tomato are considered whole, natural, or fresh foods because they are unprocessed. The apple pie, orange soda, and tomato soup are processed foods because they contain one or more whole plant foods that are treated by a chemical or industrial process. Examples of processing include drying, cooking, canning, and freezing.
- Ask students to suggest other ways to investigate the difference between whole and processed foods (instead of dropping foods into water).
- Tell students that today they will be comparing whole and processed foods using the information provided on the Nutrition Facts labels.
- Review vocabulary terms that they will use in the investigation, including energy, total fat, sodium, and carbohydrate.
- Review the components of a Nutrition Facts label using a poster or an overhead transparency, pointing out calories, total fat, sodium, and carbohydrate. Explain that calories are a unit for measuring energy in foods, and ask students to name the units used to measure the other three nutrients. *(Responses include: Carbohydrate and fat are measured in grams and sodium is measured in milligrams.)*





3) Investigation (15 minutes)

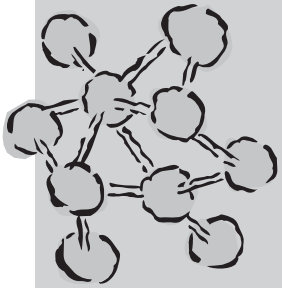
- Divide the class into student scientist teams of five students.
- Have students select their role within their student scientist team. (See "Tips for Success—Coordinating Student Scientist Teams," page 9.)
- Distribute the student work sheet, "Investigate Whole and Processed Foods."
- Show students the whole foods (orange, tomato, apple, potato, and corn) and the processed foods that contain the whole foods.
- Use a sample whole and processed food to model completing the student work sheet. (*Note: Record the amount of nutrients per serving. This lesson uses the Nutrition Facts label as a tool to compare one serving size of whole and processed foods. The number of servings per package can be included during the nutrition discussion or during a later lesson on serving size.*)
- Ask students to predict which of the foods will have the highest amount of calories, fat, carbohydrate, and sodium. Record student predictions on the "Whole or Processed: Class Predictions and Results" chart.
- Ask the student scientist team's material coordinator to gather the whole food, the corresponding Nutrition Facts label, and the processed food item for investigation. Students will use the food label for the whole food and the food package label to complete the work sheets.

4) Results (10 minutes)

- Ask each student team's data reporter to present their findings. Record results on the "Whole or Processed: Data Summary" chart for the entire class.
- Ask the student teams to share anything from their investigation that surprised them.
- Determine how well the class did with their predictions. Ask them to identify which processed foods contained the highest amounts of calories, fat, carbohydrate, and sodium. Record the answers next to the students' earlier predictions.
- Discuss and compare their predictions and results.

5) Nutrition Discussion (10 minutes)

- Using the information from the summary, have the students create a bar graph to represent and compare the amount of calories, fat, and sodium in each of the two food items they investigated.
- Ask students to explain how the information on the Nutrition Facts label can be used to make better decisions about the foods that we eat.
- Optional—Invite the teams to report the amount of nutrients they would consume if they ate the whole package. How does this compare to the recommended daily amount? (See the "Nutrition Facts" section for nutrient recommendations.)



6) Science Discussion (10 minutes)

- Review the following with the students: A calorie is a unit of energy. Our bodies need energy to survive—to breathe, move, and pump blood—and plants harness and produce energy from sunlight. We get energy from plants and other foods. (*Additional information: Different nutrients provide different amounts of energy: a gram of carbohydrates has 4 calories, a gram of protein has 4 calories, and a gram of fat has 9 calories.*)
- Ask students to name other plants that provide food and energy. What other animals besides humans obtain energy from plants? How do plants harness energy? *(Responses may include: Cows, horses, deer, and many other animals obtain evergy from plants. Plants harness energy from the sun using photosynthesis.)*
- Ask each student team to draw a simple food chain for the whole food plant and processed food they examined. Include the name of the plant, the source of energy for the plant, and one or two organisms that eat the plant or snack item they investigated.

7) Closing (15 minutes)

- Ask students if their findings support their theories.
- Ask students to summarize the most important difference between whole and processed foods.
- Have students complete the "Assessing What I Learned" student assessment. Discuss their results and ask student volunteers to share their sample healthy snack plans.

NOTE: This lesson was adapted with permission from *Healthy Foods from Healthy Soils*.

Patten, E. and Lyons, K. 2003. What are "Whole Foods?" *Healthy Foods from Healthy Soils*. Tilbury House Publishers. Gardner, Maine: 71-74.

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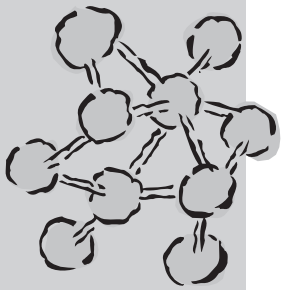


1

Activity	Reinforce this lesson and provide students with practice by introducing other whole foods and snacks and comparing them using the Nutrition Facts label.	
Resource	*Health and Wellness*—Grade 4, Lesson 3: Food Labels and Food Ads (CHKRC ID #7248) *Fruits and Vegetables Power Play! School Idea and Resource Kit*—Grade 4, Lesson 9: What's on a Label? (CHKRC ID #1364)	
Standards	**Science**	**Health** Accessing Valid Information Grade 4: 3.2.N

2

Activity	Have students work in groups to create a meal from mostly whole foods using a *Harvest of the Month* fruit or vegetable. Ask them to create another meal with two or more processed versions of the same fruit or vegetable. Ask students to write a brief one-page report about how these two meals might differ in amount of nutrients and their impact on health.	
Resource	*Harvest of the Month* (CHKRC ID #5798) or http://www.harvestofthemonth.com	
Standards	**Science**	**Health** Essential Concepts Grade 4: 1.1.N Grade 4: 1.3.N Accessing Valid Information Grade 4: 3.2.N

3

Activity	Students keep a diary to track the type and number of processed and whole foods that they eat in one day. Have each student expand their diary, by tracking the sodium, calories, and fat in the processed foods they eat in a day. Ask students to write journal notes about how they felt about the foods they ate.	
Resource	*Nutrition Pathfinders*, Activity 4: My Food Record (CHKRC ID #5020)	
Standards	**Science**	**Health** Practicing Health-Enhancing Behaviors Grade 4: 7.1.N

4

Activity	Review the nutrient cycle, and trace the production, consumption, and decomposition of a whole food snack.	
Resource	*Growing Classroom, The*—Two lessons: I Eat the Sun Lunch Bag Ecology (CHKRC ID #4923)	
Standards	**Science** Life Sciences 2b	**Health** Essential Concepts Grade 4: 1.1.N

Investigate Whole and Processed Foods

Name:_____ **Date:**_____

Names of Student Scientist Team Members

Note: *Every team member should have an assignment, and there may be more than one student assigned to one role.*

Material Coordinator:_____ Teamwork Facilitator:_____

Data Recorder:_____ Safety Coordinator:_____

Data Reporter:_____

1. Record the data from the food label for the two food items you are investigating:

Food Item	Energy (Calories)	Total Fat (Grams)	Carbohydrate (Grams)	Sodium (Milligrams)

2. Which food is whole?_____

   Which is processed?_____

3. Which food has more calories?_____

   Which has more total fat?_____

   Which has more sodium?_____

   How does processing change the whole food you investigated?

4. Which group (whole or processed) does the team think is healthier?

Class Predictions, Results, and Summary

Whole or Processed: Class Predictions and Results

	Class Prediction	Results
Most Calories		
Most Carbohydrate		
Most Total Fat		
Most Sodium		

Whole or Processed: Data Summary

	Nutrition Facts Label Data			
Food Item	**Energy (Calories)**	**Total Fat (Grams)**	**Carbohydrate (Grams)**	**Sodium (Milligrams)**
Apple				
Apple Pie				
Orange				
Orange Soda				
Corn				
Corn Chips				
Potato				
Potato Chips				

Assessing What I Learned

Name:_____ **Date:**_____

I. What I Already Knew

Directions: For each sentence, make a check in the "Before" box if you knew about this before the activity, and in the "After" box if you learned about this during the activity.

Concept		**Before**	**After**
1.	Whole foods include apples, brown rice, whole-wheat bread, grapes, lettuce, and strawberries.		
2.	Processed foods include canned soup, chips, sodas, and snack pies.		
3.	Eating plenty of whole foods from plants provides energy and is good for my health.		
4.	Eating a lot of processed foods adds extra calories, fat, and sugar, and can be unhealthy.		

II. Understanding Goals

Directions: For each concept, make a check in the "Yes" box if you think you could explain this concept to one of your classmates.

Concept		**Yes**
1.	Calories in foods provide energy, and different plant foods provide different amounts of energy to move and grow.	
2.	The difference between whole and processed foods is that processed foods are prepared and changed from their original source. Some processed foods have extra fat, sugar, and sodium.	

III. Quick Write

Directions: In the space below, write a few sentences describing a simple one-week plan to eat healthy snacks using whole foods. Include examples of whole food snacks you enjoy, and name the days you plan to eat them. Describe how you might feel after eating the snacks.

Whole Food Nutrition Facts Labels

Apple

Nutrition Facts

Serving Size 1 large apple (242g)

Amount Per Serving	
Calories 130	Calories from Fat 0
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	0%
Cholesterol 0mg	0%
Sodium 0mg	0%
Total Carbohydrate 34g	11%
Dietary Fiber 5g	20%
Sugars 25g	
Protein 1g	

Vitamin A 2%	Vitamin C 8%
Calcium 2%	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
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300 mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 Carbohydrate 4 Protein 4

Orange

Nutrition Facts

Serving Size 1 medium orange (154g)

Amount Per Serving	
Calories 80	Calories from Fat 0
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	0%
Cholesterol 0mg	0%
Sodium 0mg	0%
Total Carbohydrate 19g	6%
Dietary Fiber 3g	12%
Sugars 14g	
Protein 1g	

Vitamin A 2%	Vitamin C 130%
Calcium 6%	Iron 0%

* 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
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300 mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 Carbohydrate 4 Protein 4

Corn

Nutrition Facts

Serving Size kernels from 1 medium ear (90g)

Amount Per Serving	
Calories 90	Calories from Fat 20
	% Daily Value*
Total Fat 2.5g	4%
Saturated Fat 0g	0%
Trans Fat 0g	0%
Cholesterol 0mg	0%
Sodium 0mg	0%
Total Carbohydrate 18g	6%
Dietary Fiber 2g	8%
Sugars 5g	
Protein 4g	

Vitamin A 2%	Vitamin C 10%
Calcium 0%	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
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300 mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 Carbohydrate 4 Protein 4

Tomato

Nutrition Facts

Serving Size 1 medium tomato (148g)

Amount Per Serving	
Calories 25	Calories from Fat 0
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	0%
Cholesterol 0mg	0%
Sodium 20mg	1%
Total Carbohydrate 5g	2%
Dietary Fiber 1g	4%
Sugars 3g	
Protein 1g	

Vitamin A 20%	Vitamin C 40%
Calcium 2%	Iron 4%

* 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
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300 mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 Carbohydrate 4 Protein 4

Potato

Nutrition Facts

Serving Size 1 medium (148g)

Amount Per Serving	
Calories 110	Calories from Fat 0
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	0%
Cholesterol 0mg	0%
Sodium 0mg	0%
Total Carbohydrate 26g	9%
Dietary Fiber 2g	8%
Sugars 1g	
Protein 3g	

Vitamin A 0%	Vitamin C 45%
Calcium 2%	Iron 6%

* 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
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300 mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 Carbohydrate 4 Protein 4

Grade Four

Linking Lesson 5

Extreme Eating

Taking things to the "extreme" isn't outlandish—it is remarkably commonplace for today's youths. Even dietary habits can be "extreme." Extreme eating describes the eating habits of many youths who seem to have lost their balance when it comes to choosing an appropriate diet.

—Food Insight, International Food Information Council

Background

During the preteen and teen years, meeting caloric and nutrient needs is essential to maintaining growth rates and maturation. Yet, pre-teen students are eating more meals away from home, and consuming more calories from snacks. These practices contribute to lower consumption of fruits, vegetables, iron- and calcium-rich foods, and higher intakes of sodas. Simultaneously, youths may be experimenting with vegetarianism or unsafe weight-loss methods. These eating trends can increase youths' risk of nutrient deficiencies and chronic disease.

Recommendations

The United States Department of Agriculture's (USDA) *MyPyramid* is based on the *2005 Dietary Guidelines for Americans*. The guidelines outline the recommended amounts of each food group needed to meet nutrient needs by age, gender, and level of activity. In addition, the Institute of Medicine provides specific Dietary Reference Intakes (DRIs) nutrient recommendations. Below are the recommended daily Food Group and Dietary Reference Intakes for the nutrients addressed in this lesson:

Food Groups	Females*	Males*
Fruits	1½ - 2 cups	1½ - 2 cups
Vegetables	2 - 2½ cups	2½ - 3 cups
Grains	5 - 6 ounces	6 - 8 ounces
Meat and Beans	5 - 5½ ounces	5 - 6½ ounces
Milk	3 cups	3 cups
Oils	5 - 6 teaspoons	5 - 7 teaspoons

Nutrients	Females*	Males*
Energy	2,071 calories	2,279 calories
Carbohydrate	130 grams	130 grams
Protein	34 grams	34 grams
Total Fat	69 grams	76 grams
Vitamin A	600 micrograms	600 micrograms
Vitamin C	45 milligrams	45 milligrams
Calcium	1,300 milligrams	1,300 milligrams
Iron	8 milligrams	8 milligrams

*For moderately active youths nine to fourteen years. For youths nine to thirteen years.

How Schools Can Help

School meal programs are required to meet student nutrient needs at breakfast (30 percent) and lunch (50 percent). Referring students and families to these programs helps to supply students with needed nutrients for growth and learning. In addition, schools can provide education that helps students and families to decrease student risk for overweight and nutrition deficiencies.

Resource Web Sites:

***California Food Guide: Fulfilling the Dietary Guidelines for Americans*—http://www.cafoodguide.ca.gov**
This site provides access to the *California Food Guide: Fulfilling the Dietary Guidelines for Americans.* The resource is a collaborative project between the California Department of Health Care Services, California Department of Public Health, and the Inter-Agency Nutrition Coordinating Council. It outlines and applies the dietary guidelines to daily intake.

***2005 Dietary Guidelines for Americans*—http://www.health.gov/dietaryguidelines**
This site includes the full guidelines, with research-based advice about how good dietary habits can promote health and reduce risk for major chronic diseases; they also serve as the basis for federal food and nutrition education programs.

***MyPyramid*—http://www.mypyramid.gov**
This online resource, from the United States Department of Agriculture, features personalized eating plans, interactive tools, classroom materials, posters, brochures, and advice for making food choices from every food group.

Institute of Medicine—http://www.iom.edu
The Web site includes current projects, events, and reports concerning food, nutrition, and diet. The Institute of Medicine provides independent, objective, evidence-based advice to policymakers, health professionals, the private sector, and the public.

National Institutes of Health Office of Dietary Supplements—
http://ods.od.nih.gov/factsheets/dietarysupplements.asp
This online resource provides recommended amounts of nutrients, their functions, and food sources.

Grade Four

Linking Lesson *5*

Extreme Eating

Activity Overview

Students compare the nutrients in foods eaten by herbivores, carnivores, and omnivores. They predict and explore the health consequences of eating a limited diet.

Science Goal: Students will understand that all organisms need energy and matter to live and grow.

Nutrition Goal: Students will understand the importance of including a variety of foods in their diet.

Content Standards and Skills Covered in This Lesson

California Science Standards

Grade Four

Life Sciences

2b Students know producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs, and may compete with each other for resources in an ecosystem.

Investigation and Experimentation

6c Formulate and justify predictions based on cause-and-effect relationships.

California Health Education Standards

Grade Four

Essential Concepts

1.1.N Identify and define key nutrients and their functions.

1.3.N Describe the relationship between food intake, physical activity, and good health.

Accessing Valid Information

3.2.N Use food labels to determine nutrient and sugar content.

Cross-Disciplinary Skills

- Predicting outcomes
- Researching
- Evaluating
- Communicating results

Lesson Highlights

Materials Needed

- ❑ Pictures of a variety of herbivores (sheep, horses, rabbits, cows), carnivores (wolves, cheetahs, eagles, sharks), and omnivores (most humans, chickens, bears, pigs)
- ❑ Samples of two snacks eaten by each type of animal: herbivore (carrots, apples, corn), carnivore (beef jerky, cheese, pepperoni sticks), omnivore (quesadilla, yogurt and peaches, turkey sandwich), chip or cheese puff eater (potato chips, cheese puffs)
- ❑ Circulation model: one clear plastic container, one funnel or clear tube, vegetable shortening, and water (add red coloring to make it look like blood)
- ❑ Transparency or chart of the Nutrition Facts label
- ❑ Copies of student work sheets (one per student)
- ❑ Tape
- ❑ Sheets of plain paper (one per student team)

Preparation Time

20 minutes

Preparation Activities

- Create a chart with columns for herbivores, carnivores, and omnivores.
- Copy student work sheets for each student.
- Prepare circulation model.

Activity Time

70 minutes

This activity can be divided into two class periods:

Steps 1 to 3 (35 minutes) on day one
Steps 4 to 7 (35 minutes) on day two

Vocabulary (See the Glossary for definitions.)

Calcium	Iron	Vitamin A
Carbohydrate	Minerals	Vitamin C
Carnivore	Nutrient	Vitamins
Fat	Omnivore	
Herbivore	Protein	

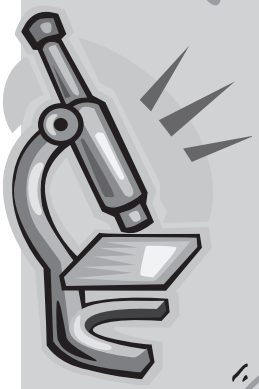
Steps for Classroom Activity

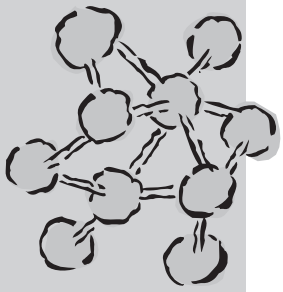
1) Warm-Up (5 minutes)

- Demonstrate the following to the students: hold up a funnel or clear tube with vegetable shortening obstructing the flow of liquids through the tube or funnel. Hold the funnel or clear tube over a clear plastic container and pour water into the funnel or tube.
- Ask the students why the liquid does not pass through the funnel or tube.
- After completing the teacher-led inquiry, summarize the students' theories about what is in the funnel and why fluids do not pass through.

2) Before the Investigation (15 minutes)

- Ask students to give a description of an herbivore, carnivore, and omnivore. *(Responses may include: Some animals are herbivores, which means they eat only plants; some animals are carnivores, which means they eat only meat; and some animals, called omnivores, eat both plants and animals.)*
- Show students the animal pictures and ask them to categorize them as herbivores, carnivores, and omnivores. *(As students categorize, place the pictures in the correct column on the board.)*
- Ask students to list foods that each animal (herbivore, carnivore, and omnivore) might eat. *(Record students' responses on the board in the appropriate columns.)* Correct as necessary during discussion.
- Tell the students that today they will investigate the nutrients found in foods eaten by herbivores, carnivores, omnivores, and one other new class of eater. They will also learn how these nutrients can impact health.
- Review the components of a Nutrition Facts label using an overhead transparency or handout. Point out the following nutrients: fat, protein, carbohydrate, vitamin A, vitamin C, calcium, and iron.
- Have students share the vocabulary or present the following information:
  - **Nutrients** are chemical substances in food that have specific functions in the body. Nutrients include: protein, carbohydrate, fat, vitamins, minerals, and water. Today, we are focusing on fat, vitamins, and minerals. (See the "Resources" section for background on all nutrients.)
  - **Fat** provides long-lasting energy, helps the body store vitamins, helps protect vital organs like your heart, kidneys, and liver, and helps keep your body warm. Consuming too much fat can be unhealthy. Eating too many foods high in fat can lead to obesity, high cholesterol, and heart





disease. Remind students about the demonstration used to start the lesson. The white material in the tube was fat; it illustrated the possible long-term consequences to the blood vessels of eating high-fat foods.

- **Vitamins** are important because they help your body use the other nutrients. Two important vitamins to consume are A and C.

  Vitamin A helps you grow, see well, and have healthy skin, and keeps you from getting sick. It can be found in green and yellow vegetables and fruits.

  Vitamin C helps your body stay strong, keeps your teeth and skin healthy, prevents infections, and heals wounds and broken bones. Vitamin C can be found in citrus fruits and green leafy vegetables.

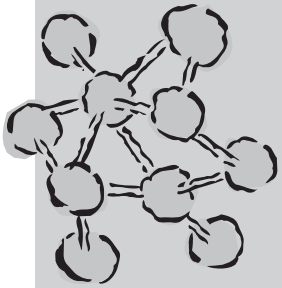
- **Minerals** are nutrients that regulate chemical reactions in the body. Two essential minerals are calcium and iron.

  Calcium is a mineral that makes bones and teeth strong, helps muscles work, and helps in proper blood clotting. Calcium can be found in dairy products such as milk and cheese, legumes and soybean products, and green leafy vegetables like broccoli.

  Iron is a mineral that helps your body resist infection and use energy from food, and helps red blood cells transport oxygen. Iron is important for children because they are growing. Good sources of iron include liver, beef, and fortified cereals.

3) Investigation (15 minutes)

- Distribute a student work sheet to each student.
- Ask the students to describe how the food label can be used to compare how healthy an herbivore, omnivore, or carnivore diet would be for a fourth grader.
- Ask students to use the "My Health Predictions" section of the student work sheet, and predict what would happen if they ate only as carnivores, herbivores, omnivores, or potato-chip or cheese-puff eaters.
- Form student scientist teams of approximately five students. (See "Tips for Success—Coordinating Student Scientist Teams," page 9.) Ask student teams to choose a data recorder, data reporter, teamwork facilitator, safety coordinator, and a material coordinator.
- Assign each team one type of diet (e.g., team one, omnivores; team two, herbivores; team three, carnivores; team four, chip and cheese-puff eaters). More than one team can be assigned the same diet type and teams can compare their results and conclusions with other teams.
- Invite the material coordinator from each group to choose a picture representing their group type (omnivore, herbivore, carnivore, and one other group—potato-chip or cheese-puff eaters) and two snacks eaten by their group type.
- Have each student team complete the "Investigating Snacks" student work sheet.



4) Results (20 minutes)

- Ask each student scientist team to create a poster that presents the group's findings. The poster includes the same elements as the work sheet: 1) the name of the group they investigated (omnivore, herbivore, carnivore, and other), 2) the two foods they examined, 3) the nutrient(s) found in highest amounts in the two snacks examined, and 4) the nutrient(s) missing or found in lowest amounts in each snack.
- Ask each team to display their poster and to share the results with the whole class.

5) Nutrition Discussion (5 minutes)

- Ask students:
  - What might happen if someone ate as an herbivore and only ate fruits and vegetables every day? Which nutrients could they be low in? (*Responses include: iron, calcium, fat, and protein*.)
  - What might happen if someone ate as a carnivore and only ate meat every day? Which nutrients could they be low in? (*Responses may include: vitamin A, vitamin C, and fiber*.)
  - Which type of diet might include the most fat? (*Responses may include: carnivore and potato-chip or cheese-puff eater.*)
  - Can people get the nutrients they need if they only eat as an herbivore or vegetarian? *(Responses may include: Some nutrients, such as iron, calcium, and protein may be more difficult to get from plant foods. However, when foods are chosen carefully, vegetarians can get most of the nutrients they need.)*
  - What are the benefits of eating as an omnivore? (*Responses may include: a more varied diet; more types of nutrients; less risk of nutrient deficiencies; more balanced diet; and more interesting, less boring diet.*)

6) Science Discussion (5 minutes)

- Ask students to describe any adaptations in the teeth of the herbivore, carnivore, omnivore, and chip or cheese-puff eater for the type of food that they eat. *(Responses may include: The teeth of carnivores and herbivores differ. Carnivores tend to have long canines and conical or triangular teeth for piercing meat, while herbivores tend to have teeth with flat tops [crowns] for chewing and grinding plant material. Omnivores usually have a variety of all kinds of teeth. Humans, bears, and raccoons are omnivores, and since they eat all kinds of food [both meat and plant material] they need all kinds of teeth.)*
- What other adaptations might carnivores and herbivores have for the diets they eat? *(Carnivores tend to have binocular vision, their eyes are at the front of the head. This allows for depth perception that is needed to catch prey. Because herbivores are often prey for other animals, they generally have their eyes on the side of their head, which gives them a wider field of view. This allows herbivores to detect their predators earlier and have a chance to flee. Carnivores have rather simple digestive tracts with few specialized organs.*

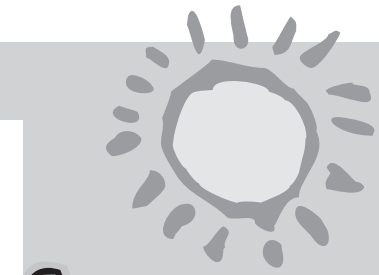
Because of the high amount of animal fat digested, most carnivores have a gall bladder. Because plant material is so difficult to digest, herbivores usually have a more complex digestive tract with special organs such as a four-chambered stomach. Because herbivores take in very little animal fat, they usually have a reduced or absent gall bladder.)

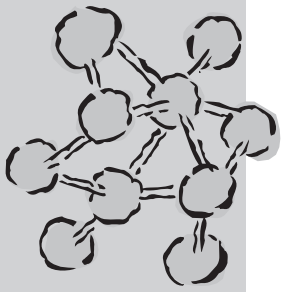
7) Closing (5 minutes)

- Conclude the lesson by telling students that humans are omnivores. Summarize that humans require a variety of nutrients and need to balance the amount of nutrients to stay healthy.
- When humans are not eating a balanced diet, their bodies may not work well. They can be at risk of diseases like heart disease or diabetes. As in the demonstration at the beginning of the class, low amounts of some nutrients and too much fat can block arteries and cause heart problems.
- Using food labels can help us balance the amount of fat and other nutrients, including iron and calcium to reduce risk of health problems.
- Have students complete the assessment activity as a homework assignment or on a different day.

NOTE: This lesson was adapted with permission from *Healthy Foods from Healthy Soils*.

Patten, E. & Lyons, K. 2003. What if All I Ate Were Potato Chips? *Healthy Foods from Healthy Soils*. Tilbury House Publishers, Gardner, Maine: 87-90.





Ideas for Extending the Lesson

The activities listed below include resources that are available for a free, four-week loan from the California Healthy Kids Resource Center (CHKRC). Additional nutrition and physical activity DVDs, curricula, references, and displays can also be borrowed. To order materials or for other resource suggestions, check the CHKRC Web site at http://www.californiahealthykids.org or call toll free (888) 318-8188.

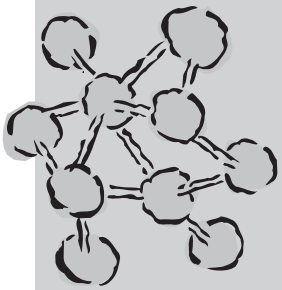
Activity	Have students work in groups to create a menu for a meal that includes all the nutrients discussed during the lesson.	
Resource	*MyPyramid for Kids Classroom Materials*, Level 2–Lesson 2: Food Math (CHKRC ID #7599) or access online at http://www.mypyramid.gov	
Standards	**Science**	**Health** Goal Setting Grade 4: 6.1.N Practicing Health-Enhancing Behaviors Grade 4: 7.1.N

Activity	Students explore the health consequences of other "extreme diets" (e.g., sweets, hamburgers, vegetarianism, fad diets, French fries).	
Resource	*Healthy Foods from Healthy Soils*, Lesson: What if All I Ate Were Potato Chips? (CHKRC ID #7305)	
Standards	**Science**	**Health** Essential Concepts Grade 4: 1.3.N Accessing Valid Information Grade 4: 3.2.N

Activity	Students create a food pyramid for a carnivore or an herbivore. Ask them to write a brief paragraph comparing their pyramid with *MyPyramid*.	
Resource	*MyPyramid for Kids Classroom Materials*, Level 2—Lesson 1: MyPyramid for Kids (CHKRC ID #7599) or access online at http://www.mypyramid.gov	
Standards	**Science**	**Health** Essential Concepts Grade 4: 1.1.N Grade 4: 1.3.N

Activity	Divide the class into student scientist teams and ask each group to explore and report on the consequences of getting too little vitamin A, iron, calcium, or vitamin C.	
Resource	*Eat Well and Keep Moving*, Lesson 10—Chain Five (CHKRC ID #6957)	
Standards	**Science**	**Health** Essential Concepts Grade 4: 1.1.N Grade 4: 1.3.N

Activity	Using the pictures of herbivores, carnivores, and omnivores; ask students to create a food chain and show the flow of energy and nutrients.	
Resource	*Healthy Foods from Healthy Soils*, Lesson: Soil Made My Supper! (CHKRC ID #7305) *The Growing Classroom*, Lesson: Cycles and Changes (CHKRC ID #4923)	
Standards	**Science** Life Sciences 2b	**Health** Essential Concepts Grade 4: 1.1.N



Activity	Students draft a plan to add more variety to the foods they eat and create a campaign about the importance of eating a variety of foods.	
Resource	*MyPyramid for Kids Classroom Materials*, Level 2–Lesson 3: Vary Your Veggies and Focus on Fruits (CHKRC ID #7599) or access online at http://www.mypyramid.gov	
Standards	**Science**	**Health** Goal Setting Grade 4: 6.1.N Health Promotion Grade 4: 8.1.N

My Health Predictions

Name:_____ **Date:**_____

Health Predictions	
My health prediction— If I were an Herbivore . . .	
My health prediction— If I were a Carnivore . . .	
My health prediction— If I were an Omnivore . . .	
My health prediction— If I were a Potato-Chip or Cheese-Puff Eater . . .	

Investigating Snacks

Name:_____ **Date:**_____

Names of Student Scientist Team Members

Note: *Every team member should have an assignment, and there may be more than one student assigned to one role.*

Material Coordinator:_____ Teamwork Facilitator:_____

Data Recorder:_____ Safety Coordinator:_____

Data Reporter:_____

Nutrient Investigation

1. Fill in the blanks below:
   Our Student Scientist Team is investigating a(n)_____ that snacks on
   _____ and _____.

2. Our first snack, _____ contains:
   _____ % Iron _____ % Vitamin A
   _____ % Calcium _____ % Vitamin C
   _____ Grams Total Fat per Serving

3. Our second snack, _____ contains:
   _____ % Iron _____ % Vitamin A
   _____ % Calcium _____ % Vitamin C
   _____ Grams Total Fat per Serving

4. The lowest nutrient in these two snacks is: _____ .

5. The highest nutrient in these two snacks is: _____ .

6. If I only ate these two snacks, I would get too much of this nutrient: _____ and not get enough of this important nutrient: _____. As a consequence: (Write a few sentences describing the possible health consequences of eating this diet.)

   _____

   _____

Assessing What I Learned

Name:_____ **Date:**_____

I. What I Already Knew

Directions: For each sentence, make a check in the "Before" box if you knew about this before the activity, and in the "After" box if you learned about this during the activity.

Concept		**Before**	**After**
1.	Sunlight and plants are the first step in the food chain for herbivores, omnivores, and carnivores.		
2.	Most humans are omnivores. They can be herbivores or vegetarians if they choose food carefully.		
3.	People need to eat a variety of plant or animal foods to get all the nutrients they need for good health.		

II. Understanding Goals

Directions: For each concept, make a check in the "Yes" box if you think you could explain this concept to one of your classmates.

Concept		**Yes**
1.	Different plant and animal foods provide different amounts of energy and nutrients to move and grow.	
2.	I may be missing key nutrients if I only eat one kind of food.	
3.	Herbivores, omnivores, and carnivores have different teeth, digestion, and other adaptations for the diets they eat.	

III. Quick Write

Directions: In the space below, write a few sentences about a healthy snack you would like to prepare with a friend using a variety of foods. Describe how you both would feel after eating the snack.

Grade Four

Linking Lesson 6

Keep It Fresh!

Most cases of food-related illness can be prevented if everyone who handles and prepares food learns how to fight bacteria. Although germs are everywhere, they can be stopped with everyday weapons such as soap and hot water, a refrigerator, and a food thermometer.

—The Partnership for Food Safety Education

Background

The food supply in the United States is very safe. However, when food is prepared, served, or stored under the wrong conditions, it can become contaminated with a variety of harmful germs. After eating contaminated food, people can develop anything from a short, mild illness, often mistakenly referred to as food poisoning, to a life-threatening disease. Infants and children are at high risk for foodborne illness because their immune systems are immature.

Recommendations

Food safety experts recommend that everyone practice food safety at each stage in the food handling process—from shopping and cooking to storing leftovers. These are the four simple food safety steps:

CLEAN: Wash hands, utensils, and surfaces in hot soapy water before and after preparing food to protect against transferring bacteria. This is especially important after handling meat, poultry, eggs, or seafood.

SEPARATE: Keep raw meat, poultry, eggs, and seafood and their juices away from ready-to-eat foods. Never place cooked food on a plate that previously held raw meat, poultry, eggs, or seafood.

COOK: Cook food to the proper temperature (this varies for different cuts and types of meat and poultry), and check for doneness with a food thermometer. Cook eggs until both the yolk and white are firm.

CHILL: After shopping, cover food items and produce properly, and place in the refrigerator or freezer promptly. Don't leave raw meat, poultry, eggs; cooked food; or cut fresh fruits or vegetables at room temperature for more than two hours before putting them in the refrigerator or freezer (one hour when the temperature is above 90°F).

How Schools Can Help

When students learn why and how to store foods safely, it sets the stage to learn other foodborne illness prevention methods. Food safety and proper hygiene can prevent the spread of infectious diseases at school and make a critical difference in student and teacher absenteeism.

Resource Web Sites

Centers for Disease Control—http://www.cdc.gov
This online resource provides accurate information on food safety and foodborne illness and offers fact sheets, statistics, and research on chronic and communicable diseases.

National Coalition for Food Safe Schools—http://www.foodsafeschools.org
This link contains Internet-based school food safety information and resources for school administrators. Through this coalition, representatives from over 50 organizations are actively involved in reducing foodborne illness in the United States.

Partnership for Food Safety Education—http://www.fightbac.org
This site includes educational materials, lessons, and research on food safety.

SNAP (School Network for Absenteeism Prevention)—http://www.itsasnap.org
The SNAP Web site provides tools for incorporating hand hygiene into multiple subject areas and activities. This project is designed to improve health by making hand cleaning an integral part of the school day.

Grade Four

Linking Lesson 6

Keep It Fresh!

Activity Overview

Student teams observe and record the characteristics of fruits and vegetables before and after conducting a simple investigation. They explore the importance of keeping foods safe to eat, and also identify valid sources for food safety information.

Science Goal: Students will understand how decomposers are related to the food chain and food safety, and they will be able to follow written instructions for a scientific investigation and understand how simple investigations can help answer questions.

Nutrition Goal: Students will understand why food safety is important and be able to identify at least one food safety practice.

Content Standards and Skills Covered in This Lesson

California Science Standards

Grade Four

Life Sciences

2b Students know producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains.

Investigation and Experimentation

6a Students differentiate observation from inference (interpretation), and know scientists' explanations come partly from what they observe, and partly from how they interpret their observations.

6c Students formulate and justify predictions based on cause-and-effect relationships.

6f Students follow a set of written instructions for a scientific investigation.

California Health Education Standards

Grade Four

Essential Concepts

1.4.N Identify how to keep food safe through proper food preparation and storage.

1.5.N Explain how food can contain germs that cause illness.

Accessing Valid Information

3.1.N Identify resources for valid information about safe and healthy foods.

Cross-Disciplinary Skills

- Predicting
- Investigating
- Evaluating
- Constructing meaning
- Communicating research findings

Lesson Highlights

Materials Needed

- ❑ Video clip "How Does Fresh Bread Differ from Stale Bread?" from the *Linking Science and Nutrition* DVD (CHKRC ID #8210) or display a piece of fresh bread and a piece of stale or moldy bread
- ❑ 6 different fresh fruits and vegetables (apple, strawberry, peach, tomato, pepper, celery)*
- ❑ Plates of each of the fruits and vegetables, sliced
- ❑ Cutting board and knife (for teacher use)
- ❑ 6 plastic bags (one per team)
- ❑ 12 labels (two per team) and 6 markers (one per team)
- ❑ Paper plates (one per team)
- ❑ Plastic gloves (two sets per student)
- ❑ Hand sanitizer or place for students to wash their hands
- ❑ Refrigerator
- ❑ Student work sheets (one per student)

*The school child nutrition director or a local grocery store or produce vendor may be able to donate fruits and vegetables for the activity.

Preparation Time

10 minutes

Preparation Activities:

- Copy student work sheets.
- Display the six whole fresh fruits and vegetables, and prepare six plates with slices of each fruit and vegetable.
- Create a class summary chart.

Activity Time

75 minutes

Can be divided into two class periods:

Steps 1 to 3 (35 minutes) on day one
Steps 4 to 6 (40 minutes) on day two

Vocabulary (See the Glossary for definitions.)

Bacteria	Decomposers	Food safety
Control	Experiment	

Steps for Classroom Activity

1) Warm-Up (5 minutes)

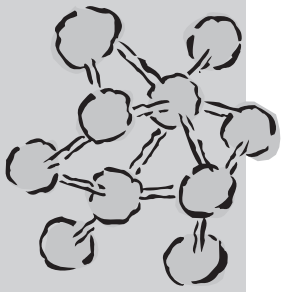
- Show the *Linking Science and Nutririon* DVD clip "How Does Fresh Bread Differ from Stale Bread?" or show a piece of fresh bread and a piece of stale or moldy bread.
- Conduct a teacher-led inquiry about why the two pieces of bread differ in appearance.
- After completing the teacher-led inquiry, summarize the students' theories about why the two pieces of bread differ. *(Possible theories include: One piece of bread is fresh or was stored properly and the other was not stored properly, one piece of bread was exposed to the air and lost moisture, and one piece of bread was exposed to bacteria or mold.)*
- Ask students if they think this happens to other foods. How could the class investigate whether this happens to other foods, and what methods keep food freshest?

2) Before the Investigation (10 minutes)

- Ask students to raise their hands if they have seen, touched, smelled, or tasted the fruits and vegetables displayed at the front of the classroom.
- Explain that these fruits and vegetables are fresh, have bright colors, smell good, and are safe to eat.
- Ask students to raise their hands if they have seen these foods when they have gone bad and are no longer fresh and safe to eat. Ask student volunteers to describe a fruit or vegetable that has gone bad.
- Ask students to describe methods that can keep fruits and vegetables safe to eat. *(Record student responses on the board.)*
- Tell students that today they will begin an experiment to investigate ways to keep fruits and vegetables fresh overnight. Tell students that their investigation will include fruits and vegetables, plastic bags, a refrigerator, and plates.

3) Investigation (20 minutes)

- Distribute the handout, "Food Storage Investigation" (one per student).
- Divide the class into student scientist teams of five students each.
- Have students select their roles within their student scientist teams (See "Tips for Success—Coordinating Student Scientist Teams," page 9).
- Ask a student to read the directions on the "Food Storage Investigation" student work sheet aloud.



- Before starting the investigation, tell students that the fruits and vegetables are part of their investigation, they are to handle them only using gloves, and they are not to eat them.
- Ask the student scientist team's material coordinator to gather the following for their team:
  a. One fresh whole fruit or vegetable
  b. One plate with that same fruit or vegetable sliced
  c. One plastic bag
  d. Two labels and one marker
  e. Gloves for each student
- Instruct the students to complete the investigation steps on the "Food Storage Investigation" student work sheet, including the BEFORE THE EXPERIMENT, OUR PREDICTION—Refrigerator, and OUR PREDICTION—Counter.
- When students have completed the investigation steps, tell them that the plastic bag with the fruit or vegetable slices will be placed in the refrigerator overnight, and their plate with the slices of fruits or vegetables will be left uncovered on the counter overnight.
- Tell the students that tomorrow they will compare the changes that have taken place in their fruits and vegetables.

4) Results (15 minutes)

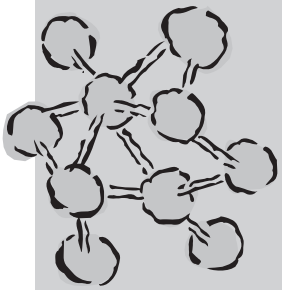
- After storing the fruits and vegetables overnight, distribute the fruits and vegetables in plastic bags and on plates to the appropriate student teams.
- Distribute the gloves for students' use.
- Remind students to handle the fruits and vegetables with gloves only, and that they are not to eat the food on the plate or in the plastic bag.
- Ask student teams to complete THE RESULTS—Refrigerator and THE RESULTS—Counter sections of their "Food Storage Investigation" work sheet."
- Ask the reporter from each student team to share the team's findings. Record the results on the board (See "Food Storage Investigation" class summary chart).

5) Nutrition Discussion (10 minutes)

- Ask students to describe why they would want to store prepared fruits and vegetables in a covered container in the refrigerator.
- Tell students the following:
  - Food safety is important for their health, and today they learned one way to keep food safe by chilling it or putting it in the refridgerator. If proper food safety practices are not used, people can become very sick.
  - Keeping perishable foods cold is one way to help fight the growth of bacteria and decay of food.






- Foods that need to stay cold include sandwiches or salads made with meat or poultry; tuna and egg salad; milk, cheese, and yogurt; and peeled or cut fruits and vegetables.

6) Science Discussion (10 minutes)

- Ask the students to compare how the fruits or vegetables changed when stored in the refrigerator and the counter overnight.
- Ask the students to discuss why these changes occurred. *(Responses may include: Loss of water, decomposition due to bacteria or germs, the lower temperature of the refrigerator kept the food fresher and slowed down rotting, covering food protected it from bacteria that could cause rotting.)*
- Ask the students which storage method kept the fruit or vegetable closest to its fresh form, and which storage method would keep the food safe to eat.
- Ask students to summarize how refrigeration impacts decomposers (bacteria, mold, and fungi). *(Responses may include: The lower temperature may have killed the decomposers, or slowed their growth and the rate of breaking down the food.)*

7) Closing (5 minutes)

- Ask students to predict what would happen if the fruit or vegetable was left out for a longer period of time. *(Responses may include: The plant or vegetable sample would dry out, break down, grow mold or bacteria, begin to turn brown or black, and rot.)*
- Ask students how the decomposers in this experiment (*bacteria, mold, and fungi*) might be harmful to people, yet are beneficial to food chains. *(Responses may include: The bacteria and germs that cause decomposition may cause foodborne illness if eaten by people. When bacteria and germs are left to decompose the fruits and vegetables, they return nutrients to the food chain.)*
- Discuss ways that families or the school food service program prevents germs from growing in foods and keeps food safe to eat. *(Responses may include: Washing hands, washing fruits and vegetables before eating them, keeping them properly stored in the refrigerator.)*
- Ask students to identify where they can find more reliable information about other practices to keep foods safe. *(Responses may include: School nutrition services, parents, school nurses, doctors, and reliable Internet sites.)*
- Have students complete the assessment activity as a homework assignment or on a different class day.

Ideas for Extending the Lesson

The activities listed below include resources that are available for a free, four-week loan from the California Healthy Kids Resource Center (CHKRC). Additional nutrition and physical activity DVDs, curricula, references, and displays can also be borrowed. To order materials or for other resource suggestions, check the CHKRC Web site at http://www.californiahealthykids.org or call toll free (888) 318-8188.

1

Activity	Students interview family and community members and gather data on home food safety methods. As a class, they construct a graph or table to illustrate the most common food safety practices.	
Resource	*FightBac!*—Grade 4, Home Food Safety Survey (CHKRC ID #1165)	
Standards	**Science** Investigation and Experimentation 6e	**Health** Essential Concepts Grade 4: 1.4.N Grade 4: 1.5.N

2

Activity	Involve students in making simple snack recipes and applying food safety skills while making snacks.	
Resource	*Nutrition to Grow On*—Lesson: Making Healthful Snacks (CHKRC ID #2342)	
Standards	**Science**	**Health** Essential Concepts Grade 4: 1.4.N Practicing Health-Enhancing Behaviors Grade 4: 7.1.N

3

Activity	Follow the lesson with a tasting of some of the fruits and vegetables used during the lesson. Incorporate student opportunities to practice food safety while tasting the fruits and vegetables (e.g., keeping items covered, washing hands before tasting, and only touching samples the student will eat).	
Resource	*Harvest of the Month* (CHKRC ID #5798) or access online at http://www.harvestofthemonth.com	
Standards	**Science**	**Health** Essential Concepts Grade 4: 1.4.N Grade 4: 1.5.N Practicing Health-Enhancing Behaviors Grade 4: 7.1.N

4

Activity	Have students find sources of valid information about food safety (e.g., Web sites, pamphlets, books), and discuss the three other ways to keep food safe to eat—clean, separate, and cook.	
Resource	California Healthy Kids Resource Center—Hot Topics menu, Food Safe Schools pages at http://www.californiahealthykids.org	
Standards	**Science**	**Health** Essential Concepts Grade 4: 1.4.N Grade 4: 1.5.N

Food Storage Investigation

Name:_____ **Date:**_____

Our Team Name or Number:_____

Names of Student Scientist Team Members

Note: *Every team member should have an assignment, and there may be more than one student assigned to one role.*

Material Coordinator:_____ Teamwork Facilitator:_____

Data Recorder:_____ Safety Coordinator:_____

Data Reporter:_____

Investigation Directions:

1. Complete the "BEFORE THE EXPERIMENT" section on your own.
2. Assign a team member to place half of the slices of the fruit or vegetable in a plastic bag and seal the plastic bag.
3. Assign a team member to place the remaining slices of the fruit or vegetable on a plate.
4. Label the bag and paper plate with the name of the fruit or vegetable and the student team number or name.
5. Wash or sanitize your hands if you touched the fruits or vegetables.
6. Write your team's predictions for the refrigerator and the counter in the table below.
7. Tell the teacher that you have completed these directions.

Name of Fruit or Vegetable	
BEFORE THE EXPERIMENT Describe the FRESH fruit or vegetable: • *What color is it?* • *How does it smell?* • *How does it feel?*	
OUR PREDICTION—Refrigerator What do you think will happen to the fruit or vegetable in the plastic bag after **one night in the refrigerator?**	
OUR PREDICTION—Counter What do you think will happen to the fruit or vegetable on the plate after **one night on the counter?**	
THE RESULTS—Refrigerator Describe the fruit or vegetable after **one night in the refrigerator**: • *What color is it?* • *How does it feel?* • *How is it different from your **fresh** description?* • *Was your prediction correct?*	
THE RESULTS—Counter Describe the fruit or vegetable after **one night on the counter**: • *What color is it?* • *How does it feel?* • *How is it different from your **fresh** description?* • *Was your prediction correct?*	

Food Storage Investigation

	Name of Fruit or Vegetable	Name of Fruit or Vegetable	Name of Fruit or Vegetable	Name of Fruit or Vegetable	Name of Fruit or Vegetable	Name of Fruit or Vegetable
BEFORE THE EXPERIMENT Describe the FRESH fruit or vegetable						
TEAM'S PREDICTION Refrigerator						
TEAM'S PREDICTION Counter						
THE RESULTS Refrigerator						
THE RESULTS Counter						

Assessing What I Learned

Name:_____ **Date:**_____

I. What I Already Knew

Directions: For each sentence, make a check in the "Before" box if you knew about this before the activity, and place a check in the "After" box if you learned about this during the activity.

Concept		**Before**	**After**
1.	Refrigeration and covering foods are safe methods of storing foods and keeping them fresh longer.		
2.	Even fresh fruits and vegetables can cause foodborne illness if not stored properly.		
3.	Washing hands is one other important way to prevent foodborne illness.		

II. Understanding Goals

Directions: For each concept, make a check in the "Yes" box if you think you could explain this concept to one of your classmates.

Concept		**Yes**
1.	After preparing foods, they should be stored in a refrigerator and covered to prevent food-borne illness	
2.	Germs and bacteria are decomposers and break down food more quickly when at room temperature than at colder temperatures.	
3.	My family or I could get sick from eating food that is not stored properly.	

III. Quick Write

Directions: In the space below, write down a few sentences about how to prepare and store a healthy snack for you and your family. Include how it could help keep your family healthy.

Compounds in My Food

For many reasons, youth tend to consume an overabundance of fast foods and snacks which are typically high in sugar, salt, and fat.

—California Food Guide: Fulfilling the Dietary Guidelines for Americans

Background

Many youths do not eat the recommended amounts of fruits and vegetables. Instead, they often consume snacks and fast food high in sugar, salt, and fat such as candy, chips, soda, and French fries. These eating patterns contribute little to the nutrient needs of youths and can compromise nutritional status and impact academic performance. Poor nutrition and inactivity also may impact students' future health status by increasing risk of obesity and obesity-related health problems such as diabetes, high blood pressure, and heart disease.

Recommendations

The *2005 Dietary Guidelines for Americans* and *MyPyramid* provide recommended amounts of sugar, salt, and fat, as well as other nutrients. The daily recommendations for sugar, salt, and fat for a boy or girl ten years of age include:

- Approximately 5 teaspoons of oil (about 25 grams)
- No more than about a teaspoon of salt (2,300 milligrams of sodium)
- 9-10 teaspoons of added sugar (about 36-40 grams) or fat

Students may eat more than this in one day; the main message is that they don't eat more than this on a regular basis.

How Schools Can Help

Giving students the opportunity to use food labels to measure and discover the amount of sugar, salt, and fat in favorite snack foods provides valid information to support students in making informed, healthier decisions. In addition, promoting parents and teachers as healthy role models, and offering healthier snack choices in school vending machines, snack shops, and fundraising activities can help reestablish a positive environment for making healthy choices.

Resource Web Sites

***California Food Guide: Fulfilling the Dietary Guidelines for Americans*—http://www.cafoodguide.ca.gov**
This online manual summarizes national and state guidelines and describes how to apply them to daily intake. The guide is a collaborative project between the California Department of Health Care Services, California Department of Public Health, and the Inter-Agency Nutrition Coordinating Council.

Centers for Disease Control and Prevention—http://www.cdc.gov
This Web site provides information about how overweight is defined for children, the prevalence of overweight, the factors associated with overweight, and the related health consequences.

***2005 Dietary Guidelines for Americans*—http://www.health.gov/dietaryguidelines**
This Web site includes the full guidelines about dietary habits that can promote health and reduce risk for major chronic diseases. These federal guidelines also serve as the basis for food and nutrition education programs.

***MyPyramid*—http://www.mypyramid.gov**
This online resource, from the United States Department of Agriculture, features personalized eating plans, interactive tools, classroom materials, posters, brochures, and advice for making food choices from every food group.

Spot the Block—http://www.nutrition.gov
This resource, developed by the Food and Nutrition Information Center and National Agricultural Library, describes the food label in language students will understand. Other sections on the Web site provide cooking, nutrition, nutrient, and supplement information.

Grade Five

Linking Lesson 7

Compounds in My Food

Activity Overview

Student teams measure and compare the amount of sugar, salt, and fat in common snack foods and beverages. They use this information to create a display of healthy and less-healthy snacks.

Science Goal: Students understand how the body uses sugar, salt, and fat, and the health consequences of over-consumption of these nutrients.

Nutrition Goal: Students understand that the Nutrition Facts label contains information about the sugar, salt, and fat in packaged foods, and that this information can be used to help make healthy food choices.

Content Standards and Skills Covered in This Lesson

California Science Standards

Grade Five

Physical Sciences

1f Students know differences in chemical and physical properties of substances are used to separate mixtures and identify compounds.

Life Sciences

2g Students know plant and animal cells break down sugar to obtain energy, a process resulting in carbon dioxide and water (respiration).

Investigation and Experimentation

6f Select appropriate tools (e.g., thermometers, meter sticks, balances, graduated cylinders) and make quantitative observations.

6g Record data by using appropriate graphic representations (e.g., charts, graphs, and labeled diagrams) and make inferences based on those data.

6i Write a report of an investigation that includes conducting tests, collecting data or examining evidence, and drawing conclusions.

California Health Education Standards

Grade Five

Essential Concepts

1.6.N Differentiate between more-nutritious and less-nutritious beverages and snacks.

1.7.N Explain the concept of eating in moderation.

Accessing Valid Information

3.2.N Interpret information provided on food labels.

Health Promotion

7.1.N Use guidelines to identify healthy snacks.

Cross-Disciplinary Skills

- Investigating
- Quantifying
- Evaluating
- Constructing meaning
- Communicating research findings

Lesson Highlights

Materials Needed

- ❑ *Linking Science and Nutrition* DVD (CHKRC ID #8210) with a video clip entitled, "Why Does the Diet Soda Float while the Classic Soda Sinks?" or a clear tank of water, a diet soda, and a regular soda
- ❑ Poster or overhead transparency of a Nutrition Facts label
- ❑ Overhead projector
- ❑ Sugar (1/2 lb)
- ❑ Salt (1/4 lb)
- ❑ Vegetable shortening (12 ounces)
- ❑ Measuring spoons for each team
- ❑ Plastic bags (one per student)
- ❑ Weighing scale
- ❑ Marking pens for each team
- ❑ One large piece of poster paper for each team
- ❑ Tape
- ❑ Copies of student work sheets (one per student)

Preparation Time

20 minutes

Preparation Activities

- Assign students to bring Nutrition Facts labels from their favorite snack foods.
- Display materials and post Nutrition Facts label.
- Copy student work sheets.

Activity Time

70 minutes

Can be divided into two class periods:

Steps 1 to 3 (30 minutes) on day one
Steps 4 to 6 (40 minutes) on day two

Vocabulary (See the Glossary for definitions.)

Blood pressure	Insulin	Sodium
Cholesterol	Mixture	Trans fat
Compound	Saturated fat	Unsaturated fat
Diabetes	Simple carbohydrates	

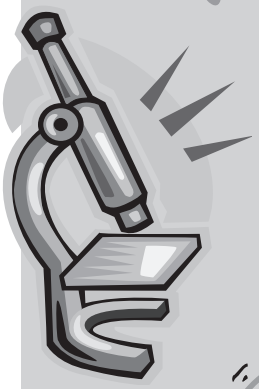
Steps for Classroom Activity

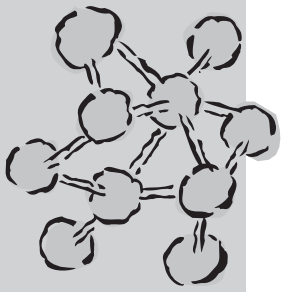
1) Warm-Up (5 minutes)

- Show the *Linking Science and Nutrition* DVD clip entitled, "Why Does the Diet Soda Float while the Regular Soda Sinks?" The clip shows a diet soda and a regular soda placed in a clear tank of water. (Optional: Conduct this demonstration for the class.)
- Conduct teacher-led inquiry related to the demonstration. The teacher leads the students in an inquiry discussion to stimulate their thinking about the properties of different compounds in diet soda and regular soda.

2) Before the Investigation (10 minutes)

- Review compounds and mixtures with students. *(A compound is two or more elements that are chemically combined, and mixtures are two or more elements or compounds that are blended without combining chemically.)* Ask students to provide some examples of compounds and mixtures that could be found in the sodas. *(Examples of compounds include: Sugar, water, salt, and artificial sweeteners. Examples of mixtures include: The soda is a mixture of different compounds, and examples of other mixtures include smoothies, trail mix, fruit yogurt, and dipping sauces.)*
- Explain that the students will be exploring compounds in some of their favorite snacks. Ask the students what they would like to know about compounds, such as sugar, salt, and fat. Compile a short list of student-generated questions on the board. For example:
  - How much more sugar is there in a regular soda compared to a diet soda?
  - Is there sugar, salt, and fat in our favorite snacks and drinks?
  - How does the amount of sugar, fat, and salt compare in our favorite snacks and drinks?
  - Could I be getting too much sugar, salt, or fat from my favorite snacks and drinks?
- Tell the students that today they will form student scientist teams to investigate and determine if their favorite foods are healthy for them based on the foods' sugar, salt, and fat content.
- Review the components of a Nutrition Facts label using the overhead transparency (in the "Resources" section), point out total carbohydrate (this will be used as an indicator of sugar content), sodium (this will be the indicator used to compare salt content), and total fat (this will be the indicator used to compare fat content).



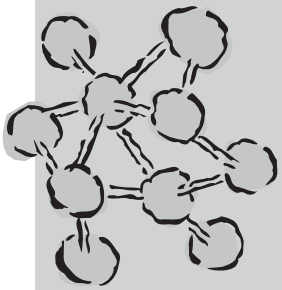


3) Investigation (15 minutes)

- Divide the students into student scientist teams. Suggest no more than five students per team. (See "Tips for Success—Coordinating Student Scientist Teams" on page 9.)
- Ask each team to choose one compound to investigate: sugar, saltl, or fat.
- Have each team's material coordinator gather items for the investigation: plastic bags, measuring spoons, and one of the following: sugar, salt, or vegetable shortening.
- Have each student share with his or her team the snack wrapper they brought from home.
- Instruct each team to use the food label to determine the amount of the compound (sugar, sodium, or fat) in the snack item, and record the information on their student work sheet.
- Ask each team to rank the items on their student work sheet from highest to lowest based on the sugar, sodium (salt), or fat content.
- Explain to students that they will also create visual examples of the amount of the compound (sugar, salt, or fat) in each snack item. Demonstrate the conversion of weight to teaspoons using the scale to weigh one teaspoon of each compound: carbohydrate or sugar, sodium (salt) or total fat.
  - 4 grams of sugar = 1 teaspoon
  - 6 grams of salt = 1 teaspoon = approximately 2,300 milligrams (mg) of sodium
  - 4 grams of fat = 1 teaspoon
- Optional: Ask students to use the scale and measuring spoons to determine the conversion of grams to teaspoons.
- Ask the data recorder in each group to label a plastic bag for each of the snack items investigated. The facilitator assigns one or two team members to use measuring spoons to measure the amount of sugar, salt, or fat for each snack item, and place the measured amount in the corresponding labeled plastic bag.
- After each group has measured the amount of sugar, salt, or fat for each snack, they create a poster that includes the name of each snack item and the plastic bag with the amount of salt, fat, or sugar measured. Encourage the teams to arrange the snacks in order of how healthy they are.

4) Results (10 minutes)

- Have each student team present the results from their investigation to the class by displaying their poster and presenting the following information:
  - The five snacks they investigated
  - The compound they chose to measure
  - The snack with the highest amount of sugar, salt, or fat per serving



5) Nutrition and Science Discussion (20 minutes)

- Explain to the students that we need some sugar, salt, and fat for health. These compounds are needed for energy, growth, and balancing water in our bodies.
- Share with the students the following information about carbohydrates:
  - **Carbohydrates** include sugars and starches. Carbohydrates are compounds that are an important source of energy. Sugars are a simple type of carbohydrate that provide quick energy. Sugars are compounds made up of three elements: carbon, hydrogen, and oxygen. Starches are made of many simple sugars connected together.
  - Sugars occur naturally in many foods, such as milk, fruit, some vegetables, and honey. Sugars can also be added to foods during processing and preparation (e.g., candy, cereals, desserts, and soda), or when they are eaten.
  - For many people, sugar should be used in moderation because when the body doesn't use the sugar for energy, it is stored as fat.
  - Too much sugar can increase a person's weight and lead to tooth decay.
- Determine who in the class has the snack item with the most grams of sugar per serving.
- Share with students the following information about salt:
  - **Salt** is a compound of two elements, sodium and chloride. The food label lists the amount of sodium in a food. Foods that are low in sodium are low in salt.
  - Although sodium is an essential nutrient, nearly all Americans consume much more sodium (salt) than they need.
  - On average, the natural salt content of food, salt added at the table, or salt added when cooking, accounts for a small part of our intake. Most salt is added to foods by food manufacturers. So most salt is found in processed foods.
  - Too much salt can raise an individual's blood pressure. Keeping blood pressure in the normal range reduces an individual's risk of coronary heart disease, stroke, congestive heart failure, and kidney disease.
- Determine who in the class has the snack item with the most grams of salt per serving.
- Share with students the following information about fat:
  - **Fat** is an essential nutrient that is a source for long-lasting energy. It helps carry vitamins, protects vital organs, and keeps the body warm. This compound is made of three elements: carbon, hydrogen, and oxygen.
  - Fats are classified as unsaturated, saturated, or trans fat. Saturated fat comes primarily from products like butter, cream, and cheese; meats and poultry; and solid vegetable oils like palm and coconut oil.

Unsaturated fat is found in plant products like vegetable oils, nuts, olives, avocados, and fatty fish like salmon. Trans fat is made when manufacturers add hydrogen to vegetable oil in a process called hydrogenation. Processed foods and shortening are often hydrogenated and contain trans fat.

- Eating too many foods high in fat can lead to obesity, high cholesterol, and heart disease.

- Determine who in the class has the snack item with the most grams of fat per serving.
- Ask the students: "Do you know how much sugar you need each day? What about salt? What about fat? How do the amounts of sugar, salt, and fat in the snacks compare with the recommended amount?" *(Refer to the recommended amounts in the "Recommendations" section at the beginning of the lesson.)* Share with the students the recommended amounts for sugar, salt, and fat. The *2005 Dietary Guidelines for Americans* recommends about five teaspoons of oil, no more than about a teaspoon of salt, and 9 to 10 teaspoons of added sugar or fat each day for a ten year-old boy or girl. Students may eat more than this in one day; the main message is not to eat more than this on a regular basis.

6) Closing (10 minutes)

- Ask students to write a reflective paragraph that compares the amount of sugar, salt, or fat in the snacks they investigated with the recommended amounts of these nutrients. Direct them to include the potential consequences of eating too many of these snacks and how they can apply this information to their own snacking habits.
- Invite students to share their discoveries and conclusions.
- Complete the assessment as a homework assignment or on another class day.

NOTE: This lesson was adapted with permission from the *CANFit Super Manual*.

California Adolescent Nutrition & Fitness Program 2004. Activity 3—The Low- Down on Sugar and Activity 4—The Low-Down on Fat. The *CANFit Super Manual*. California Adolescent Nutrition and Fitness Program, Berkeley, California: 63-66 and 67-68.

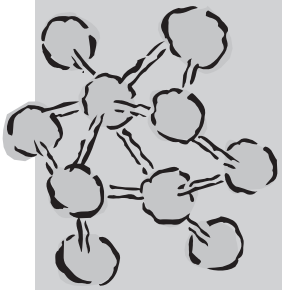
Ideas for Extending the Lesson

The activities listed below include resources that are available for a free, four-week loan from the California Healthy Kids Resource Center (CHKRC). Additional nutrition and physical activity DVDs, curricula, references, and displays can also be borrowed. To order materials or for other resource suggestions, check the CHKRC Web site at http://www.californiahealthykids.org or call toll free (888) 318-8188.

Activity	Have students create posters with graphs that compare the sugar, salt, and fat content of one *Harvest of the Month* fruit or vegetable with one of the snacks they investigated. (For example, a bar graph with the fat, salt, and sugar content of chips with the same information about corn in a different color bar.)	
Resource	*Harvest of the Month* (CHKRC ID #5798) or http://www.harvestofthemonth.com	
Standards	**Science** Investigation and Experimentation 6g	**Health** Accessing Valid Health Information Grade 5: 3.2.N

Activity	Have students select a healthful eating goal that includes lowering either their sugar, salt, or fat content. Ask students to write a brief paragraph about how they plan to achieve the goal.	
Resource	*Fruits and Vegetables Power Play!* Activity 5: Fruit and Vegetable Power Play! Challenge. (CHKRC ID #1365)	
Standards	**Science**	**Health** Goal Setting Grade 5: 6.1.N

Activity	Have students work in groups and use a decision-making process to select healthful snacks for a school vending machine, a school fundraiser, or other events. Ask students to consider their findings of sugar, salt, or fat in foods. Ask students to write a brief paragraph about how they plan to create a healthier vending machine.	
Resource	*Eat Well Keep Moving*, Lesson 19—Snack Decisions. (CHKRC ID #6957)	
Standards	**Science**	**Health** Decision Making Grade 5: 5.1.N



Activity	Student groups make a healthy snack using one of the recipes from *Harvest of the Month* and follow proper food safety procedures.	
Resource	*Harvest of the Month* (CHKRC ID #5798) or http://www.harvestofthemonth.com	
Standards	**Science**	**Health** Practicing Health-Enhancing Behaviors Grade 5: 7.1.N

Comparing Compounds in Our Favorite Snacks

Name:_____ **Date:**_____

Our Team Name or Number:_____

Names of Student Scientist Team Members

Note: *Every team member should have an assignment, and there may be more than one student assigned to one role.*

Material Coordinator:_____ Teamwork Facilitator:_____

Data Recorder:_____ Safety Coordinator:_____

Data Reporter:_____

Compound Measured (circle one): Salt (Sodium) Carbohydrate Total Fat

Conversion: One teaspoon of_____ equals_____grams.

	Snack	**Amount of Compound**		**Ranking**
		From Food Label (grams or milligrams)	In Teaspoons	
1.				
2.				
3.				
4.				
5.				
6.				

7. Write two to three sentences comparing the amounts of fat, sugar, or salt in these snacks to the amount recommended for a ten year-old.

_____

_____

_____

_____

Invent a Healthier Snack

Students will choose simple ingredients to invent a healthier snack. They create a Nutrition Facts label for the snack and compare the amount of each compound and element (carbohydrate, sodium [salt], and total fat) in their snack to the amount of each compound and element in the snack items investigated in the lesson.

Instructions:

Explain to the students that they were selected, as top food scientists, to develop a new snack for a giant food company. The company makes several of the snacks investigated during the lesson and wants to make a healthier option for students. Give each student the following handouts:

- "Invent a Healthier Snack Ingredient List"
- "Snack Research and Development"

Instruct the students to use two or more of the ingredients from the "Invent a Healthier Snack Ingredient List" to create their snack. They will then name their snack and create a Nutrition Facts label using the nutrient information from each ingredient. Ask students to complete the remaining questions on the "Snack Research and Development" work sheet. The handouts include all the instructions for the assessment activity.

Invent a Healthier Snack
Ingredient List

Ingredient 1: Apple Chips, Dried

Nutrient Information:

Total Carbohydrate	18.6 g (grams)
Total Fat	0.9 g (grams)
Sodium	24.6 mg (milligrams)

Ingredient 2: Sunflower Seeds (roasted, not salted)

Nutrient Information:

Total Carbohydrate	6.8 g
Total Fat	14.0 g
Sodium	0.85 mg

Ingredient 3: Fresh Blueberries

Nutrient Information:

Total Carbohydrate	4.0 g
Total Fat	0.1 g
Sodium	1.7 mg

Ingredient 4: Pretzels

Nutrient Information:

Total Carbohydrate	23.0 g
Total Fat	0.7 g
Sodium	57.0 mg

Ingredient 5: Oatmeal Cinnamon Crisp Cereal

Nutrient Information:

Total Carbohydrate	23.0 g
Total Fat	1.3 g
Sodium	108.0 mg

Ingredient 6: Yogurt (low-fat frozen or flavored regular)

Nutrient Information:

Total Carbohydrate	9.5 g
Total Fat	1.2 g
Sodium	29.8 mg

Nutrient information is for an ounce serving of each ingredient. The nutrient information was obtained from the *Nutrition Analysis Tool*—http://www.nat.uiuc.edu. The *Nutrition Analysis Tool* is a software research tool owned by the Board of Trustees of the University of Illinois.

Snack Research and Development

Name:_____ **Date:**_____

Congratulations, you are on the Research and Development Snack Team! Use two or more of the items listed on the "Invent a Healthier Snack Ingredient List" to invent your snack. Give your snack a wonderful name, complete the Nutrition Facts label, and answer the questions.

1. Invent your snack. Select two or more ingredients from the "Invent a Healthier Snack Ingredient List" to include in your snack and write down the nutrient information.

Name of Ingredients	Nutrients		
	Total Carbohydrate (gm)	Total Fat (gm)	Sodium (mg)
Nutrient Total:			

2. Name your snack and complete the Nutrition Facts label for your invention:

Name of Snack

Nutrition Facts
Serving Size: _____
Total Carbohydrate: _____g
Total Fat: _____g
Sodium: _____mg
Ingredients: (list ingredients in your snack)

3. Describe your healthy snack invention and answer the questions below:

a. Is your snack invention a mixture or a compound? Why?

b. Briefly describe how you chose the ingredients for your snack invention.

c. Is your snack invention healthier or less healthy than the other snacks you investigated? Why?

Fiber Race Tract

A wealth of information supports the position that youth and adults should consume adequate amounts of dietary fiber from a variety of plant foods.

—American Dietetic Association

Background

Intakes of good sources of dietary fiber such as fruits, vegetables, whole and high-fiber grain products, and legumes are low among youth and adults. Increasing fiber-rich foods can aid in lowering blood cholesterol levels, contribute important micronutrients, and help to normalize blood glucose and insulin levels. In addition, fiber can prevent constipation and is also associated with a lower risk of colon cancer.

Recommendations

The recommended fiber intake is 20-35 grams per day for healthy adults or 14 grams per 1,000 calories consumed. For children, fiber intake is usually calculated as their age plus 5 to 10 grams of fiber per day (e.g., the recommended intake for a ten year-old would be 15-20 grams of fiber each day).

How Schools Can Help

With education and encouragement, most healthy children can increase their intake of fruits, vegetables, and whole grains and achieve adequate dietary fiber intakes.

Resource Web Sites

American Dietetic Association—http://www.eatright.org
This site provides nutrition fact sheets, recipes, and tips for eating a healthy diet.

American Heart Association—http://www.americanheart.org
This site includes research, resources, and recommendations for adults and children to reduce risk of cardiovascular illness. It includes fiber recommendations and other practical suggestions.

American Institute for Cancer Research—http://www.aicr.org
This site includes the *Facts About Fiber* brochure and other materials that can be downloaded for free. This organization is a leader in researching the role of diet and nutrition in preventing cancer.

***2005 Dietary Guidelines for Americans*—http://www.health.gov/dietaryguidelines**
This site includes the full guidelines about dietary habits that can promote health and reduce risk for major chronic diseases. The appendixes include tables with nutrient and fiber content of many foods.

***Nutrition Analysis Tool*—http://www.nat.uiuc.edu**
This online tool, developed by the University of Illinois, can be used to look up the nutrient and fiber content of hundreds of foods.

Grade Five

Linking Lesson 8

Fiber Race Tract

Activity Overview

Student teams compare the rates in which high-fiber versus low-fiber foods move through a simulated digestive system. They plan a menu to include more fiber.

Science Goal: Students understand the digestion process and how fiber helps to maintain digestive health.

Nutrition Goal: Students will understand the importance of including foods high in fiber in their diets.

Content Standards and Skills Covered in This Lesson

California Science Standards

Grade Five

Life Sciences

2c Students know the sequential steps of digestion and the roles of the teeth, and the mouth, esophagus, stomach, small intestine, large intestine, and colon in the function of the digestive system.

Investigation and Experimentation

6b Develop a testable question.

6c Plan and conduct a simple investigation based on a student-developed question and write instructions others can follow to carry out the procedure.

6e Identify a single independent variable in a scientific investigation and explain how this variale can be used to collect information to answer a question about the results of the experiments.

California Health Education Standards

Grade Five

Essential Concepts

1.3.N Explain the relationship between the intake of nutrients and metabolism.

1.6.N Differentiate between more-nutritious and less-nutritious beverages and snacks.

1.8.N Describe the benefits of eating a nutritionally-balanced diet consistent with current research-based dietary guidelines.

Accessing Valid Information

3.2.N Interpret information provided on food labels.

Decision Making

5.1.N Use a decision-making process to identify healthy foods for meals and snacks.

Cross-Disciplinary Skills

- Investigating
- Creating models
- Evaluating
- Constructing meaning
- Communicating research findings

Lesson Highlights

Materials Needed

- ❑ Video clip entitled, "How Would the Process of Digestion Differ for Eating a Sponge Cake and an Apple?" from *Linking Science and Nutrition* DVD (CHKRC ID #8210) or demonstrate by eating a piece of an apple and a piece of sponge cake
- ❑ Digestive system poster
- ❑ 8 to 12 inches of clear plastic tubing with a one-inch opening (one per team), a 5- to 6-inch diameter funnel to fit each tube (one per team)
- ❑ Plastic gloves for each student
- ❑ Bowl or pan for each team
- ❑ A small glass of water for each team
- ❑ Plastic tablecloth for each team
- ❑ Copies of student work sheets (one per student)
- ❑ Party or Healthy Party items for each student team (include Nutrition Facts labels)
  Party Foods: One frosted snack cake and chips
  Healthy Party Foods: ½ cup of pre-packaged shredded vegetables (carrots) and ½ cup of raw sunflower seeds

Preparation Time

20 minutes

Preparation Activities

- Display the foods for the investigation.
- Organize materials for each team: pan, gloves, funnel, tubing, water, plastic tablecloth, party foods.
- Post the digestive system poster.
- Make copies of student work sheets (one per student).

Activity Time

70 minutes

Can be divided into two class periods:

Steps 1 to 3 (30 minutes) on day one
Steps 4 to 6 (40 minutes) on day two

Vocabulary (See the Glossary for definitions.)

Digestion	Intestine	Scientific model
Fiber	Peristalsis	Variable

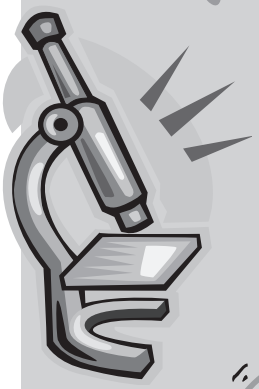
Steps for Classroom Activity

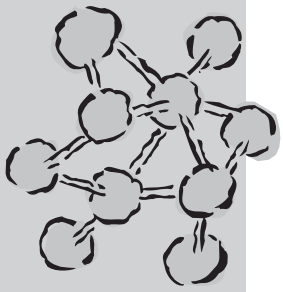
1) Warm-Up (5 minutes)

- Show the *Linking Science and Nutrition* DVD clip entitled, "How Would the Process of Digestion Differ for Eating a Sponge Cake and an Apple?" or demonstrate by inviting one or two students to consume pieces of a high-fiber and a low-fiber food.
- The teacher leads the students in an inquiry discussion to stimulate their thinking about the digestive process and how the process might differ for foods with different amounts of fiber.

2) Before the Investigation (15 minutes)

- Use a poster to review the digestive system.
- Hold up the funnel and plastic tubing and explain that today these items (and the hands) will be used to represent the digestive system. Have students draw pictures of the hands, funnel, and tube, and label them as the parts of the digestive system they represent. *(Responses may include: The hands and fingers represent the mouth and teeth and will be used to "chew" foods, the funnel represents the stomach, and the tubing represents the intestines.)*
- Ask students how a model digestive system could be used to investigate the question posed in the demonstration. Record student responses. Summarize their responses, and explain that scientific models are used to represent a system or set of conditions in order to investigate a question or to test a hypothesis that is difficult to investigate directly.
- Ask students to compare and contrast the two foods included in the demonstration. Summarize student responses, and emphasize that one of the differences between the two foods is the amount of fiber in each. Ask students to describe fiber. *(Responses may include: Fiber is a form of carbohydrate which the body can't digest, it is roughage, or it is parts of plants that can't be digested.)*
- Show the students the foods that will be used in the investigation. Hold up each food item, and have students raise their hands when they think a food is high in fiber.
- Ask the class how they could use the model digestive system to explore how low- and high-fiber foods are digested. What questions could be investigated? *(Responses may include: Is there a difference in the speed of digestion of low- and high-fiber foods? What happens to the intestine when a high-fiber food is eaten? What happens to the intestine when a low-fiber food it eaten? Which type of food is healthier for the intestine?)* What steps could be used to answer these questions?





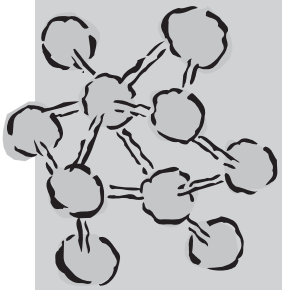
- Tell the students that today they will form teams to investigate how high-fiber and low-fiber foods move through the model digestive system.

3) Investigation (10 minutes)

- Divide the students into student scientist teams. Include no more than five students per team. (See "Tips for Success—Coordinating Student Scientist Teams," page 9.)
- Ask each team's material coordinator to obtain their equipment (*A set of food items, plastic table cloth, clear plastic tubing, funnel, plastic gloves, pan or bowl, and water*).
- Distribute a "Digestion Investigation" work sheet to all students, and tell the teams that the team data recorder will share the team's results for all members to record on their student work sheets.
- Have students work with their team to discuss and predict which food will take longer to move through the model digestive system, and which will move faster. Students record their predictions on their work sheets.
- Have each team data recorder name the team's food items and read the amount of fiber in each. The data recorder and team members record the fiber data.
- The teacher leads the teams in the "digestive process:"
  1. Instruct student teams to select team members for each of the investigative tasks (e.g. one student to support the digestive system, another student to "chew" the food with their gloved hands, and another student to pour water). Check team assignments; and review student roles as outlined on the "Digestion Investigation" student work sheet. Students record the names of team members assigned to each role.
  2. Instruct the team to assemble the model of the digestive tract. *(Attach the funnel and tubing, or have it pre-assembled.)*
  3. Review how the model represents the digestive system. *(Their hands will act as the mouth, the funnel as the stomach, the water as saliva, the tube as the intestine, and the end of the tube as the anus.)*
  4. Instruct assigned students to put on the gloves, and hold the model over the pan or bowl.
  5. Lead the teams through the digestive process:
     - Assigned students "chew" the foods with their gloved fingers (for about 10-15 seconds).
     - Next the "chewed" food is placed in the model stomach (funnel).
     - Assigned students pour a small amount of water to simulate saliva.
     - Another assigned student gently squeezes the clear tubing to model peristalsis.
     - The data recorder notes the length of time the food takes to move through the system.






6. Ask students to record and comment on their observations. *(Note: The cake and chip combination should move slowly or very little, and leave the most residue. The "Healthy Party Food" should move through the model quickly and leave little residue.)*
7. Have students clean up their area.

4) Results (10 minutes)

- Ask the team data reporters to share the results of their investigation (i.e., names of food items, amount of fiber in each item, and minutes it took for foods to move through the digestive system, and other observations). Record each team's results on the board.

5) Nutrition Discussion (10 minutes)

- Ask the students to discuss what they learned about fiber and digestion from using the model and completing the investigations. *(Responses may include: The fiber helps to move food through the digestive system and helps maintain a healthy digestive tract.)*
- Share the following information about fiber with the students:
  - Fruits, vegetables, and grain products such as whole grain breads, cereals, pasta, and rice are good sources for fiber.
  - The *2005 Dietary Guidelines for Americans* recommend that students ten years of age eat about 15-20 grams of dietary fiber a day. Adults need to eat more, about 20-35 grams per day.
  - Briefly discuss how the party foods could contribute to meeting the recommended amount of fiber.

6) Science Discussion (10 minutes)

- What measures were used to compare the digestion of high- and low-fiber foods? *(Responses may include: Two measures were used to compare digestion, time [measured in minutes] and observations of the tubing or digestive tract.)* Explain that time and the observations are variables in this investigation; they are used to compare the results of the experiment. For example, when the amount of fiber in food changes, the length of time the food takes to travel through the digestive system varies. Ask the class to describe one other variable and how it varies when the high-fiber and low-fiber foods are used in the investigation. *(Responses may include: The observations also varied with the type of food "eaten." Foods with less fiber left more residue in the tubing.)*
- Ask students to review the teams' results. Did team results differ? Why? *(Responses may include: Team results differed with the type of food investigated. Team results may also have differed due to how the team conducted the experiment, e.g., pouring more water in the tube.)*
- How could we improve the model to make it more like our own digestive system? *(Responses may include: The model would have been more realistic if the tubing was longer—the actual length of the intestine is about 25 to 28 feet.)*

- What does the model tell us about digestion of foods? *(Responses may include: The model demonstrates that fresh fruits, vegetables, seeds, and other foods high in fiber move quickly through the tract.)*

7) Closing (10 minutes)

- Ask students to identify accurate ways to find out about the fiber content of foods. *(Responses may include: We find out about the fiber content of foods by reading the ingredients or checking the Nutrition Facts label.)*
- Ask students to think about how to add more fiber to their diets. Ask for volunteers to share their ideas.
- Write "Breakfast," "Lunch," and "Dinner" on the board or flip chart, and ask students to recommend high-fiber foods to include at each meal.
- Assign each student team a meal and have them create one menu that includes high-fiber foods.
- Have students complete the student assessment activity as a homework assignment or during another class.

NOTE: This lesson was adapted with permission from *TWIGS Gardening/ Nutrition Curriculum*.
University of California Cooperative Extension. 1997, Revised 2008. "Staying Fit with Fiber," *TWIGS Gardening/Nutrition Curriculum*. Half Moon Bay, CA: University of California Cooperative Extension, San Mateo and San Francisco Counties. http://cesanmateo.ucdavis.edu

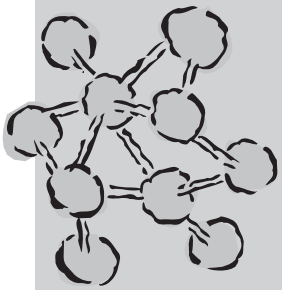
Ideas for Extending the Lesson

The activities listed below include resources that are available for a free, four-week loan from the California Healthy Kids Resource Center (CHKRC). Additional nutrition and physical activity DVDs, curricula, references, and displays can also be borrowed. To order materials or for other resource suggestions, check the CHKRC Web site at http://www.californiahealthykids.org or call toll free (888) 318-8188.

Activity	Ask each student to record the foods they eat for one day and add up their fiber intake using the food labels or a nutrition analysis tool. Students compare their intake to daily recommendations and set an individual one-week goal to increase their fiber intake. After one week, they write a paragraph to describe their progress toward reaching their goal.	
Resource	*Planet Health*, Lesson 37—Go for the Goal! (CHKRC ID #1048) *Nutrition Analysis Tool*—http://www.nat.uiuc.edu The *Nutrition Analysis Tool* (NAT) is a software research tool owned by the Board of Trustees of the University of Illinois.	
Standards	**Science** Investigation and Experimentation 6g	**Health** Accessing Valid Health Information Grade 5: 3.2.N Goal Setting Grade 5: 6.1.N

Activity	Divide the class into four or more student teams. Have each team investigate fruits and vegetables included in one season of *Harvest of the Month* activities. Each team ranks, by fiber content, the fruits and vegetables for their season. Ask each team to present their results and describe the benefits of eating the fruits and vegetables from their season.	
Resource	*Harvest of the Month*, Educators' Newsletter, Nutrition Facts Labels. (CHKRC ID #5798) or access online at http://www.harvestofthemonth.com	
Standards	**Science**	**Health** Essential Concepts Grade 5: 1.2.N Grade 5: 1.8.N

Activity	Students make a list of a variety of favorite snacks found at home or at a local grocery store. They write predictions for which foods would keep the digestive tract healthy and those that that would be less healthy. Students describe the reasons for their predictions. Using a nutrient analysis tool or by reading food labels, students record the actual amount of fiber in each item.	
Resource	*Fruits and Vegetables Power Play!* Activity 8: What's on a Label? (CHKRC ID #1365) *Nutrition Analysis Tool*—http://www.nat.uiuc.edu The *Nutrition Analysis Tool* (NAT) is a software research tool owned by the Board of Trustees of the University of Illinois.	
Standards	**Science**	**Health** Essential Concepts Grade 5: 1.3.N Practicing Health-Enhancing Behaviors Grade 5: 7.1.N



Digestion Investigation

Name:_____ **Date:**_____

Names of Student Scientist Team Members

Note: *Every team member should have an assignment, and there may be more than one student assigned to one role.*

Material Coordinator:_____ Teamwork Facilitator:_____

Data Recorder:_____ Safety Coordinator:_____

Data Reporter:_____

1. Our Predictions

The foods that will take the **longest amount of time** to move through the digestive system are:

_____

The foods that will take the **least amount of time** to move through the digestive system are:

_____

2. Our Investigation

Choose team members to create the model digestive system. Then listen carefully for the teacher's directions to conduct the investigation.

a. Support the model digestive system. (One student holds the connected funnel and tubing over the pan or bowl.)

Name of team member: _____

b. Act as the mouth. (One student "chews" the food with their gloved fingers and place food in the mouth/funnel.)

Name of team member: _____

c. Create saliva or drink some water. (One student pours a small amount of water into the funnel.)

Name of team member: _____

d. Model peristalsis. (One student squeezes the tube gently with their hands.)

Name of team member: _____

3. Our Results

Record the name of the food items, the amount of fiber listed on the food label for each item, and the amount of time it took for the two items to move together through the digestive tract.

Food Item	Fiber (grams)	Time (minutes)

4. Our Observations

Briefly summarize your group's observations of the digestion of the two food items. How might this affect a person's health and their digestive tract?

You Are Invited!

Students review a shopping list of foods and plan a party for a kindergarten class. They create an invitation to invite the students to the event. The invitation includes the items that will be served and why it will be tasty, healthy, and fun!

Instructions:

1. Distribute the "You are Invited—A Special Invitation!" assessment handout to each student.

2. Inform the students that they just won a prize—free shopping for a special event. They will use the foods from their shopping spree to prepare a special party for a kindergarten class. They are to include foods that are high in fiber and plan a special game to teach the students the parts of the digestive system.

3. Students can use the *Nutrition Analysis Tool* to research the fiber content of the items on the shopping list. The URL is http://nat.uiuc.edu.

4. After they have planned the event, they are to write a special invitation to the kindergarten class to come to the party, and explain how it will be delicious, healthy, and fun!

You are Invited–A Special Invitation!

Name:_____ **Date:**_____

You have just won a special shopping prize! You can choose from any of the items below to plan a special party for a kindergarten class at your school. After you have selected the menu for the event, write a special invitation and describe how the party will be healthy, delicious, and fun!

1. Special Party Shopping List—Select three to four items that you will serve at the party:

- ☐ Crunchy Vegetables and Wow Dip
- ☐ Mile-High Frosted Cake
- ☐ Whole Wheat Zesty Crackers
- ☐ Fresh, Juicy Fruit Salad
- ☐ Cool Carrot-Bran Muffins
- ☐ Bubbly Soda
- ☐ Sparkling Apple and Grape Juice
- ☐ Fluffy Popcorn
- ☐ Triple Salty Barbeque Chips
- ☐ Fresh, Cold Water
- ☐ Super Creamy Dip and Chips
- ☐ Other:_____

2. Write the menu for the special party and explain why you selected these foods.

Food	**Why**

3. Describe a game that young students could play at the party. The purpose of the game is to teach them the parts of the digestive system and how they help digest food (include a minimum of the mouth, stomach, and intestine).

_____

_____

_____

_____

_____

_____

4. Create an invitation for students in a kindergarten class. Describe the menu, the special digestion game, and how this party will be delicious, healthy, and fun!

You Are Invited!

Menu

Special Game

Genes, the Environment, and Active Prevention

The majority of biological phenomena we observe involve both genes and the environment, not either/or.

—Hsein Hsein Lei

Background

The diseases that contribute most to illness, death, and disability among Americans have changed dramatically over the last 100 years. Today, chronic diseases, such as cardiovascular disease, cancer, and diabetes are among the most prevalent, costly, and preventable of all health problems. Regular activity and healthy eating contribute to reducing the risk of many of these chronic diseases.

Recommendations

The *2005 Dietary Guidelines for Americans* and *Physical Activity Guidelines for Americans* provide recommendations for children, adolescents, and adults on the importance of being physically active, and eating a healthy diet to promote good health and reduce the risk of chronic diseases. These recommendations include the following guidelines for children and adolescents:

- 30 to 35 percent of calories from fat for children two to three years of age
- 25 to 35 percent of calories from fat for children and adolescents four to eighteen years of age
- Eat mostly polyunsaturated and monounsaturated fats found in fish, nuts, and vegetable oils
- Children and adolescents should do 60 minutes (one hour) or more of physical activity daily. Encourage youth to participate in a variety of physical activities that are appropriate for their age and that are enjoyable.
  - **Aerobic:** Most of the 60 or more minutes a day should be either moderate- or vigorous-intensity aerobic physical activity, and should include vigorous-intensity physical activity at least three days a week.
  - **Muscle-strengthening**: As part of their 60 or more minutes of daily physical activity, children and adolescents should include muscle-strengthening physical activity on at least three days of the week.
  - **Bone-strengthening**: As part of their 60 or more minutes of daily physical activity, children and adolescents should include bone-strengthening physical activity on at least three days of the week.

How Schools Can Help

School policies, nutrition services, nutrition education, and physical activity promotion go hand-in-hand. Providing instruction about the benefits and importance of adequate physical activity and eating healthy foods, educates and prepares students and parents to support changes in school meals, fundraisers, and other events.

Resource Web Sites

American Heart Association—http://www.americanheart.org
This site includes research, resources, and recommendations for adults and children to reduce risk of cardiovascular illness. It includes nutrition and physical activity recommendations and other practical suggestions.

***California Food Guide: Fulfilling the Dietary Guidelines for Americans*—http://www.cafoodguide.ca.gov**
This site provides a summary of federal and state dietary guidelines and describes how to apply them to daily intake. It is offered as a collaborative project between the California Department of Health Care Services, California Department of Public Health, and the Inter-Agency Nutrition Coordinating Council.

Centers for Disease Control and Prevention—http://www.cdc.gov
This Web site provides information about nutrition, physical activity, and health for children, teens, and adults.

***2005 Dietary Guidelines for Americans*—http://www.health.gov/dietaryguidelines**
This site includes the full guidelines about dietary habits that can promote health and reduce risk for major chronic diseases. The appendixes include tables with nutrient and fiber content of many foods.

***Physical Activity Guidelines for Americans*—http://www.health.gov/PAGuidelines**
This site provides guidelines that outline the benefits of physical activity for Americans of all ages and provide recommendations for levels of physical activity that promote health.

***Nutrition Analysis Tool*—http://www.nat.uiuc.edu**
This online tool, developed by the University of Illinois, can be used to look up the nutrient and fiber content of hundreds of foods.

Grade Seven

Linking Lesson 9

Genes, the Environment, and Active Prevention

Activity Overview

Student teams research the genetic and environmental links for and the prevention of several nutrition-related chronic diseases. They use their findings to develop their own "dietary guidelines."

Science Goal: Students will understand that chronic diseases have genetic and environmental links.

Nutrition Goal: Students will be able to identify healthy eating and activity habits that can reduce the risk of and help prevent chronic diseases.

Content Standards and Skills Covered in This Lesson

California Science Standards

Grades Seven and Eight

Genetics

- 2c Students know an inherited trait can be determined by one or more genes.

Structure and Function of Living Systems

- 5a Students know plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.
- 5b Students know organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system.

Investigation and Experimentation

- 7a Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.
- 7b Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence.
- 7e Communicate the steps and results from an investigation in written reports and oral presentations.

California Health Education Standards

Grades Seven and Eight

Essential Concepts

- 1.1.N Describe the short- and long-term impact of nutritional choices on health.
- 1.5.N Differentiate between diets that are health-promoting and diets linked to disease.
- 1.10.N Identify the impact of nutrition on chronic disease.

Accessing Information

- 3.1.N Distinguish between valid and invalid sources of nutrition information.

Cross-Disciplinary Skills

- Investigating
- Conducting research
- Communicating results

Lesson Highlights

Materials Needed

- ❑ Clue cards on chronic diseases (one per student)
- ❑ Computers with Internet access or library resources to find answers to questions about chronic diseases
- ❑ Student work sheets (one per student)
- ❑ Student handouts (one per student)
- ❑ Order copies of the *2005 Dietary Guidelines for Americans* for each team by calling (866) 512-1800 or download from the Web site listed at the beginning of the lesson

Preparation Time

15 minutes

Preparation Activities

- Copy the clue cards, one card for each student, so that there are the same number of students in each clue card group.
- Reserve library or computers for student use during class.
- Make copies of student work sheets and handouts (one per student).

Activity Time

115 minutes

Can be divided into two class periods:

Steps 1 to 3 (55 minutes) on day one
Steps 4 to 6 (60 minutes) on day two

Vocabulary (See the Glossary for definitions.)

Cancer	Heart disease	Overweight
Diabetes	High blood pressure	Prevention
Gene	Obesity	Risk factor

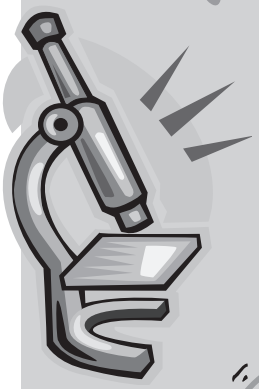
Steps for Classroom Activity

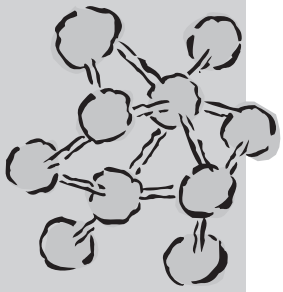
1) Warm-Up (10 minutes)

- Distribute the clue cards with the "causes" and "symptoms" for the mystery diseases.
  - Clue Card 1 (Heart Disease)
  - Clue Card 2 (High Blood Pressure)
  - Clue Card 3 (Diabetes)
  - Clue Card 4 (Cancer)
- Ask students to walk around the room and find other students with the same clues ("causes" and "symptoms") as theirs and to stand together as a group.
- When groups are formed, ask students to determine what disease they think their group represents.
- Ask students to share their discussions and determinations, and have students return to their seats.

2) Before the Investigation (5 minutes)

- Inform the class that these causes and symptoms represent four chronic diseases: heart disease, high blood pressure, diabetes, and cancer. Correct the students' guesses.
- Share the following with the students:
  - A chronic disease is a persistent and lasting medical condition that usually lasts more than three months.
  - Chronic diseases—such as heart disease, cancer, and diabetes—are the leading causes of death and disability in the United States. Chronic diseases account for 70 percent of all deaths in the U.S.
  - These chronic diseases also cause major limitations in daily living for almost 25 million people.
  - Although chronic diseases are among the most common and costly health problems, they are also among the most preventable. Adopting healthy behaviors such as eating nutritious foods, being physically active, and avoiding tobacco use can prevent or control the devastating effects of these diseases.
- Tell the students that today they will work in teams to research these four chronic diseases, and that tomorrow each team will present their findings.





3) Investigation (40 minutes)

- Distribute the "Preventing Chronic Diseases" student work sheet.
- Divide the class into four teams, and assign each team one of the four chronic diseases to research.
- Distribute and review the handout, "Accessing Reliable and Trustworthy Health Information."
- Tell students that they will work in teams to research and answer the questions on the handout. They will need to provide a list of the sources they use to complete the investigation, and the sources they use should be reliable and trustworthy. The "Accessing Reliable and Trustworthy Health Information" handout will help them determine which sources to use. Review and discuss the handout and proper citation conventions with the students.
- Review the assignment questions.
- Inform teams that they will be presenting their research findings to the class. Request that teams include posters or PowerPoint presentations to present their results.
- Have students use the Internet and other library sources to research the answers to the questions.

4) The Results (40 minutes)

- Have each student team present their findings (ten minutes per team) and respond to any questions from classmates.

5) Nutrition Discussion (5 minutes)

Discuss the following questions as a class:

- Does physical activity help to prevent any of these diseases? What are the recommendations? Write responses on the board.
- Do these diseases have similar recommendations for foods to limit? If so, what are they? Write responses on the board.
- Do these diseases have similar recommendations for foods to consume more of? If so, what are they? Write responses on the board.
- If a person wanted to prevent these diseases, what would be some healthy options for lunch? Write responses on the board.

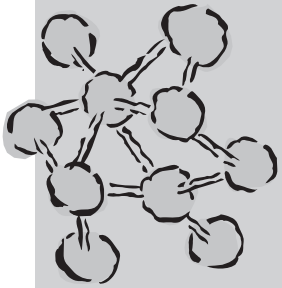
6) Science Discussion (5 minutes)

Discuss the following questions as a class:

- Do these diseases have any similar environmental risk factors? If so, what are they? Record responses on the board.
- Do these diseases have any similar heredity or genetic risk factors? If so, what are they? Write responses on the board.
- What environmental changes could a community make to help reduce the risk of one or more of these chronic diseases? Write responses on the board.





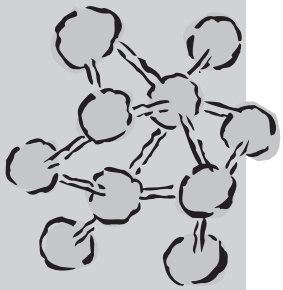

7) Closing (10 minutes)

- List or circle the shared recommendations generated during the nutrition discussion. With the class, create summary recommendations that could reduce the risk of most of these chronic diseases.
- Distribute copies of the *2005 Dietary Guidelines for Americans* for each team.
- Ask students to compare their recommendations to those in the document.
- Explain that the *2005 Dietary Guidelines for Americans* and the *Physical Activity Guidelines for Americans* were developed in a similar way. Many scientists studied factors and research related to these diseases, and met to discuss common recommendations that could help prevent these diseases. Together, scientists from the United States Departments of Agriculture (USDA) and Health and Human Services (HHS) developed these guidelines to protect the health of Americans. Approximately every five years, these recommendations are reviewed and updated based on new scientific research.
- Complete the class assessment poll at the end of class or on another class day.

Ideas for Extending the Lesson

The activities listed below include resources that are available for a free, four-week loan from the California Healthy Kids Resource Center (CHKRC). Additional nutrition and physical activity DVDs, curricula, references, and displays can also be borrowed. To order materials or for other resource suggestions, check the CHKRC Web site at http://www.californiahealthykids.org or call toll free (888) 318-8188.

Activity	Students access information about foods low in fat and high in nutrients and types of moderate to vigorous activities. They develop a brochure showcasing health-promoting foods and physical activities that could contribute to reducing the risk of chronic diseases.	
Resource	*Media-Smart Youth: Eat, Think, and Be Active!*, Lesson 4, Activity B—Cutting Back on Fat and Added Sugar; and Lesson 5, Activity B—Activities Fit to Be Tried. (CHKRC ID #7393) *Nutrition Analysis Tool*—http://www.nat.uiuc.edu The *Nutrition Analysis Tool* (NAT) is a software research tool owned by the Board of Trustees of the University of Illinois.	
Standards	**Science** Investigation and Experimentation 7a and b	**Health** Essential Concepts Grades 7 and 8: 1.5.N Grades 7 and 8: 1.6.N Grades 7 and 8: 1.12.N Grades 7 and 8: 1.14.N Health Promotion Grades 7 and 8: 8.1.N Grades 7 and 8: 8.3.N



2

Activity	Students create a student survey to assess current eating habits related to the prevention of chronic diseases.	
Resource	*Exercise Your Options*, Lessons: 2- and 3-Food Group Experts (CHKRC ID #5331)	
Standards	**Science**	**Health** Essential Concepts Grades 7 and 8: 1.5.N Health Promotion Grades 7 and 8: 8.3.N

3

Activity	Students identify and research other nutrition-related health problems and determine the role of environmental and genetic factors in each (e.g., anemia, scurvy, osteoporosis).	
Resource	*Exercise Your Options*, Lessons: 2 and 3, Food Group Experts (CHKRC ID #5331)	
Standards	**Science** Investigation and Experimentation 7a and b	**Health** Essential Concepts Grades 7 and 8: 1.5.N Grades 7 and 8: 1.7.N Grades 7 and 8: 1.10.N

4

Activity	Students interview parents or an older adult and compare the environmental (external) influences on food choice and activity from the time they were teens to current influences. How are they different and similar? How could these changes contribute to the American obesity crisis? What changes could be made to counteract negative influences?	
Resource	*FUEL: Energy for Action* (CHKRC ID #2826)	
Standards	**Science**	**Health** Essential Concepts Grades 7 and 8: 1.5.N Grades 7 and 8: 1.10.N Analyzing Influences Grades 7 and 8: 2.2.N Grades 7 and 8: 2.4.N

Genes, the Environment, and Active Prevention

Clue Card 1

Symptoms:

- Shortness of breath
- Palpitations (irregular heartbeats)
- Fast heart rate
- Weakness or dizziness
- Nausea
- Sweating

Causes or Risk Factors

- Tobacco smoke
- Family history of heart disease
- High blood cholesterol
- High blood pressure
- High-fat, unhealthy eating habits
- Physical inactivity
- Obesity and overweight

Clue Card 2

Symptoms:

- Headache
- Dizziness
- Blurred vision
- Nausea

Causes or Risk Factors

- Physical inactivity
- Family history of high blood pressure
- Unhealthy eating habits
- Overweight or obesity
- Excessive salt intake
- Stimulants, diet pills, and some pills used for cold symptoms (they can raise blood pressure)

Clue Card 3

Symptoms:

- Feeling thirsty
- Having to urinate more than usual
- Losing weight without trying to
- Feeling very tired and cranky
- Infections, cuts, and bruises that heal slowly
- Blurred vision
- Tingling or numbness in your hands or feet

Causes or Risk Factors

- Damage to cells in the pancreas
- Family history of diabetes
- Physical inactivity
- Overweight or obesity
- High-fat, unhealthy eating habits

Clue Card 4

Symptoms:

- A new mole or a change in an existing mole
- A sore that does not heal
- Hoarseness or a cough that does not go away
- A hard time swallowing
- Weight gain or loss with no known reason
- Feeling weak or very tired

Causes or Risk Factors

- Tobacco use
- Strong sunlight
- Exposure to certain chemicals and other substances
- Family history of cancer
- Unhealthy eating habits
- Physical inactivity
- Overweight or obesity

Accessing Reliable and Trustworthy Health Information

Today information is abundant. However, not all sources of information are reliable and trustworthy. You need to know how to determine if a source is reliable and trustworthy.

Here are questions you should ask to evaluate the reliability and trustworthiness of health information.

- Who or what is the source or author of the information?
- What qualifications or credentials does the person or group have? Are they experts on the topic?
- When was the information published? Is there contact information or a place you can go for more information? (Try to include sources no more than five years old.)
- Is the information up-to-date?
- What is the purpose of the information—to educate, to entertain, or to persuade you to buy something?

Some reliable and trustworthy sources of health information are:

- Healthcare professionals, such as doctors and dentists.
- Government health resources, such as the Centers for Disease Control and Prevention (CDC), the National Institutes of Health (NIH), and the World Health Organization (WHO). All of these organizations have Web sites. Their Web addresses usually end in .gov.
- Health-related organizations, such as the American Heart Association, American Cancer Society, and the American Lung Association. All of these organizations also have Web sites. Their Web addresses usually end in .org.
- Educational organizations, such as colleges and universities. Many of these institutions also have Web sites. Their Web addresses often end in .edu.
- Library resources, such as encyclopedias, and health and medical journals.

Preventing Chronic Diseases

Chronic Disease:_____

Names of Student Scientist Team Members

List the names of your team members below. Select one or two students to facilitate the group. All team members should research and summarize information to answer the questions and to prepare for the class presentation.

Group Facilitator:_____Teamwork Facilitator:_____

Name:_____Name:_____

Name:_____Name:_____

Find answers to the following questions, using at least three different sources of information. Include the information and citations in a presentation to your classmates about the chronic disease.

1. How many people will be affected by this disease this year?

2. How many people will die from this disease this year?

3. What are the chances that people will become ill with this disease sometime in their life?

4. What are the risk factors for this disease? Identify those that are genetic (family history) and environmental.

5. What are the screening tests for this disease?

6. What are the symptoms of this disease?

7. Does physical activity help reduce the risk of this disease or prevent it? What kinds of physical activities are recommended?

8. What foods should people limit to reduce their risk or prevent this disease?

9. What foods should people consume to reduce their risk or prevent this disease?

10. List the sources you used to answer the questions above.

11. Why did you choose these sources?

Class Comprehension Poll

Instructions for the Teacher:

Copy and cut the following set of five questions into two strips of paper so that each student can fill out and turn it in anonymously. This at-a-glance "quiz" will give you a sense of how the class understands the concepts.

Question	Circle the correct answer
1) Diseases are related to:	a) Genetics b) The environment c) Both a and b
2) Health behaviors can prevent or reduce:	a) Our risk of disease b) Our genetic risk c) Our DNA
3) What can reduce our risk of some diseases?	a) Physical activity b) Watching TV c) Nutrition choices d) Both a and c
4) We can choose behaviors that increase physical activity.	TRUE or FALSE
5) Cardiovascular disease is only hereditary.	TRUE or FALSE

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3) What can reduce our risk of some diseases?	a) Physical activity b) Watching TV c) Nutrition choices d) Both a and c
4) We can choose behaviors that increase physical activity.	TRUE or FALSE
5) Cardiovascular disease is only hereditary.	TRUE or FALSE

Tasty Packages

I love to think of nature as an unlimited broadcasting system.

—George Washington Carver

Background

Healthy People 2010 provides national health objectives designed to identify the most significant preventable threats to health and to establish goals to reduce these threats. One of the *Healthy People 2010* objectives is to increase the percentage of children who consume at least two servings of fruit daily from 28 percent to 75 percent.

Recommendations

The *2005 Dietary Guidelines for Americans* includes recommended amounts of fruits and vegetables based on age, gender, and activity level. The recommended ranges for daily consumption of fruits and vegetables for moderately active children ages eleven to fourteen are:

	Boys	Girls
Fruits	2 cups	1½ - 2 cups
Vegetables	2½ - 3 cups	2½ cups

How Schools Can Help

Students' exposure to the variety of fruits and vegetables available in California may be limited by income, culture, or family. Hosting regular produce tastings and inviting Farmers' Market and family farm representatives to the school and family events create opportunities for students to experience new flavors that can lead to small changes in fruit consumption that lead to big health benefits.

Resource Web Sites

***California Food Guide: Fulfilling the Dietary Guidelines for Americans*—http://www.cafoodguide.ca.gov**
This site provides a summary of federal and state dietary guidelines and describes how to apply them to daily intake. It is offered as a collaborative project between the California Department of Health Care Services, California Department of Public Health, and the Inter-Agency Nutrition Coordinating Council.

Community Alliance with Family Farmers—http://www.caff.org
This Web site includes resources and campaigns for farm to school programs and is designed to encourage purchase of local produce. The organization is a movement of rural and urban people to foster family-scale agriculture that cares for the land.

***2005 Dietary Guidelines for Americans*—http://www.health.gov/dietaryguidelines**
This site includes the full guidelines for promoting health and reducing risk for major chronic diseases. These guidelines also serve as the basis for federal food and nutrition education programs.

Fruits and Veggies Matter—http://www.fruitsandveggiesmatter.gov
This Centers for Disease Control and Prevention Web site provides benefits, tips, recipes, and recommendations for fruit and vegetable intakes for all ages.

***Harvest of the Month*—http://www.harvestofthemonth.com**
This *Network for a Healthy California* site provides access to nutrition and gardening information about fresh California produce, as well as newsletters for educators, parents, and food services.

***Healthy People 2010*—http://www.healthypeople.gov**
This Web site includes publications, indicators, and other resources to aid states and communities to develop strategic health plans. *Healthy People 2010* is a set of health objectives for the United States.

***MyPyramid*—http://www.mypyramid.gov**
This online resource, from the United States Department of Agriculture, features personalized eating plans, interactive tools, classroom materials, posters, brochures, and advice for making food choices from every food group.

San Francisco Botanical Garden—http://www.sfbotanicalgarden.org
This site describes the botanical gardens as a resource for class field trips and family outings. Most major cities have a garden and their Web sites often offer events, podcasts, and teaching resources.

Grade Seven

Linking Lesson 10

Tasty Packages

Activity Overview

Students dissect and investigate different types of fruits and identify mechanisms of seed dispersal. They discover how these characteristics can be used to classify fruit and then taste a fruit salad prepared by the class.

Science Goal: Students observe the diversity of fruits and their function, and understand the importance of applying a system of classification based on structural parts and mechanisms of seed dispersal.

Nutrition Goal: Students understand that eating a variety of fruits provides many nutrients, and that consuming the recommended amount of fruits can have a positive impact on weight and reduce risk of chronic diseases.

Content Standards and Skills Covered in This Lesson

California Science Standards

Grade Seven

Structure and Function in Living Systems

- 5a Students know that plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.
- 5f Students know the structures and processes by which flowering plants generate pollen, ovules, seeds, and fruits.

Investigation and Experimentation

- 7a Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.
- 7d Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge.
- 7e Communicate the steps and results from an investigation in written reports and oral presentations.

California Health Education Standards

Grades Seven and Eight

Essential Concepts

- 1.2.N Identify nutrients and their relationship to health.
- 1.6.N Analyze the caloric and nutritional value of foods and beverages.
- 1.8.N Identify ways to prepare food that are consistent with current research-based guidelines for a nutritionally balanced diet.

Practicing Health-Enhancing Behaviors

- 7.1.N Make healthy food choices in a variety of settings.
- 7.2.N Explain proper food handling safety when preparing meals and snacks.

Cross-Disciplinary Skills

- Observing
- Classifying
- Communicating Results
- Writing Reports

Lesson Highlights

Materials Needed

- ❑ One set of ten "Fruit Classification Pictures" per team
- ❑ Display of "mystery" fruits (washed), two of the same fruit per team (strawberry, peach, grapes, grapefruit, cantaloupe, or other fruit)
- ❑ Cutting board for each team
- ❑ Paper towels
- ❑ Large bowl and serving spoon
- ❑ For each team: serrated plastic knife or clean scalpel, medium bowl, ½ cup (4 ounces) paper cups, small spoons, and napkins for tasting fruit salad
- ❑ Copies of student work sheets (one per student)

Preparation Time

30 minutes

Preparation Activities

- Ask the school food service, local grocery store, or supermarket to donate the fruits needed. If cost is a factor, one fruit per team could be used.
- Make copies of student work sheets (one per student).
- Copy and cut "Fruit Classification Pictures" (place in one envelope with ten pictures per team).
- Organize student team materials and display mystery fruit.
- Make a copy of the class summary chart on a transparency or paper.

Activity Time

85 minutes

Can be divided into two class periods:

Steps 1 to 4 (40 minutes) on day one
Steps 5 to 7 (45 minutes) on day two

Vocabulary (See the Glossary for definitions.)

Achene	Drupe	Pome
Aggregate fruit	Dry fruit	Seed
Berry	Hesperidium	
Dispersal	Pepo	

Steps for Classroom Activity

1) Warm-Up (10 minutes)

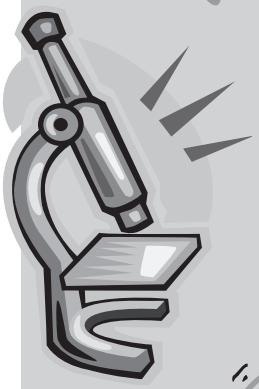
- Preface this activity with a flower observation or dissection to review the different parts of flowers, and the sequence of events from pollination to fertilization of an egg. (See "Flower Model Illustration" in this lesson.)
- Summarize by explaining that fruits are the packaging for seeds of the plant. The fruit usually develops from the pistil of the flower after it is fertilized.
- Divide the class into student scientist teams of five students. (See "Tips for Success—Coordinating Student Scientist Teams," page 9.) Explain that they will work in student teams to classify pictures of fruits.
- Explain that scientists have classification systems for categorizing many things, including chemicals, stars, and living things like animals. Scientists also group plants and fruits with shared characteristics into the same class or category.
- Give each team an envelope with ten pictures of fruits, and ask them to work with their team to create categories to classify the fruits based on their similarities.
- Ask teams to share the classification systems they created.

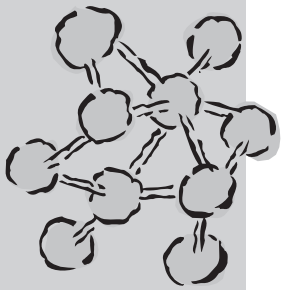
2) Before the Investigation (15 minutes)

- Distribute the "Fruit Classification" student work sheet. Have students use the descriptions and examples to reclassify the pictures. Review the categories and provide the correct classification of the fruit pictures.
- Briefly discuss what characteristics were used to determine the scientific categories for fruit. *(Responses may include: Shape, color, and texture [firm, leathery, fleshy, soft] could be used to classify fruit.)*
- Show the class five different "mystery" fruits. Explain that each student team will receive a different "mystery" fruit to investigate and correctly classify.

3) Investigation (15 minutes)

- Distribute the "Fruit Investigation" student work sheet. Have students select their role within their student scientist team and write the names next to each role.
- Inform the teams that the purpose of their investigation is to correctly classify the "mystery" fruit into one of the eight fruit classes. They will observe and dissect the fruit to help them categorize it.





Based on their observations and the information in the "Fruit Classification" student work sheet, they will classify their "mystery" fruit. After categorizing it, they will prepare a second piece of fruit for a fruit salad prepared by the class.

- Review safe use of knives, proper handwashing, and food safety techniques. (Refer to "Tips for Success—Maintaining a Safe and Positive Classroom," page 3.) Ask one or two student team safety coordinators to repeat the knife and food safety tips for the class.
- Review the "Directions for the Investigation" and "Directions for Fruit Salad Preparation and Tasting" instructions on the "Fruit Investigation" student work sheet with the class.
- Ask each team's material coordinator to gather materials for the investigation. Each team's coordinator collects two pieces of one kind of whole fruit, a scalpel or small serrated plastic knife, a cutting board, a bowl, napkins, sample cups, and small spoons.
- Ask student teams to wash their hands. The team's teamwork facilitator assigns one team member to use plastic gloves as they carefully follow the directions to dissect the "mystery" fruit. All student team members draw the dissection of each fruit and label their drawings.
- The teamwork facilitator assigns one team member to cut the second piece of fruit into small pieces.
- After all teams have cut up the second piece of fruit and added it to the class salad bowl, ask the teams' material coordinators to get small samples for each team member. As students sample the class salad, ask them to answer questions one to six on their "Fruit Investigation" work sheet.

4) The Results (5 minutes)

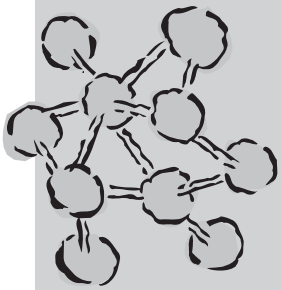
- Ask student team data reporters to summarize the team's findings and record the classification of each fruit investigated on the "Class Fruit Investigation" summary chart.

5) Science Discussion (10 minutes)

- After observing, drawing, and consuming various kinds of fruits and identifying them, ask students to discuss question two on the "Fruit Investigation" student work sheet. How does dissection help to classify and identify fruits? *(Responses may include: Dissection provides a closer look at the structure inside the fruit and how the seeds are organized; these characteristics help with classification.)*
- Discuss question three on the "Fruit Investigation" student work sheet. Why is it important to classify plants and fruits? *(Responses may include: Classification provides shared understanding of the characteristics of plants and fruits, including the conditions for growing them and their dispersal mechanisms.)*
- The fruit not only helps to classify plants, it protects the seed and helps to transport the plant from one place to another. Why are some fruits so sweet






and juicy, while others are hard and dry? *(Responses may include: It has to do with how seeds are dispersed. The sweet fruits are eaten by animals, and the seeds are carried around inside the animal to be deposited in another location after passing through the digestive tract. Dry fruits split open, allowing their seeds to scatter on the ground.)*

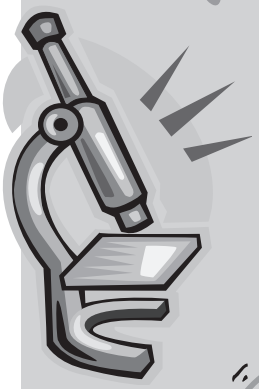
- Discuss question five on the "Fruit Investigation" student work sheet. Why is seed dispersal important to the plant? *(Responses may include: Dispersal methods ensure that as many seeds as possible have a good chance of growing up to produce plants and seeds.)*

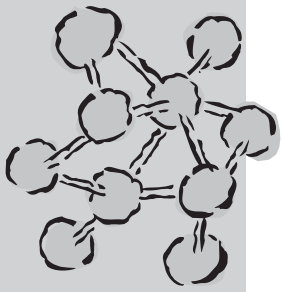
6) **Nutrition Discussion (15 minutes)**

- Ask students to identify the food safety steps they followed while preparing the fruit salad. *(Responses may include: Handwashing, use of gloves, and washing and peeling fruit.)*
- Ask students to share their rating of the fruit salad on the "Fruit Investigation" student work sheet question six (e.g., thumbs up if they rated the recipe as three or more stars or thumbs down if they rated it as two or more stars). What would they add or reduce to improve the recipe?
- Distribute the "Fruit Nutrient Information Sheet" to the student teams that corresponds to the fruit investigated by each group.
- Have students complete question number seven on the "Fruit Investigation" student work sheet. What three nutrients are highest in the fruit they investigated?
- Ask team data reporters to list the three nutrients that are highest in their fruit and how those nutrients impact health. *(Record their responses on the "Class Fruit Investigation" summary chart.)*
- Give team members five minutes to complete question eight on the "Fruit Investigation" work sheet. How would they share this recipe with their family?

7) Closing (15 minutes)

- Display a transparency or chart of the recommended amount of fruits and vegetables needed by students aged eleven to fourteen years. (See "Class Fruit Investigation" summary chart.) Ask students to guess how many servings they consumed when tasting the fruit salad. Note that a full paper cup is about a ½ cup serving.
- Ask students to compare their intake during class with the recommended daily amount. How many more servings of fruit will they need to meet the amount recommended? Ask volunteers for examples of how they plan to add more fruit for snacks, lunch, or dinner to meet the daily fruit recommendation. What nutrients would be supplied to their bodies?





- Ask for student volunteers to read their quick write about sharing the fruit salad recipe with their family or friends. Encourage students to try this recipe at home. Remind them that even eating small amounts of fruit and vegetables contributes to the total needed each day.
- Complete the student assessment as homework or during an upcoming class.

NOTE: ***This lesson was created by Raleigh Philip, M.A., and illustrations and photos are included with permission from Mike Huddleston, Faculty Biology, North Lake College, Dallas County Community College District, Texas, United States of America.***

Ideas for Extending the Lesson

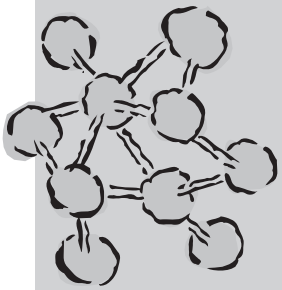
The activities listed below include resources that are available for a free, four-week loan from the California Healthy Kids Resource Center (CHKRC). Additional nutrition and physical activity DVDs, curricula, references, and displays can also be borrowed. To order materials or for other resource suggestions, check the CHKRC Web site at http://www.californiahealthykids.org or call toll free (888) 318-8188.

Activity	Ask students to keep a diary of fruits and vegetables eaten over three days. How do they compare with the recommended number of daily servings? With the class, generate and post a chart of favorite fruit and vegetable additions to breakfast, lunch, dinner, and snacks. Students select a fruit and vegetable buddy (e.g., parent, guardian, trusted adult, or friend) who reminds them about ideas for eating more fruits and vegetables, and encourages them to reach their goal of eating the recommended number of servings. Compare students' intake before and after creating the chart and choosing fruit and vegetable buddies. Did their intake improve? What did they learn? Did they try any new fruits or vegetables prepared in a new way?	
Resource	*EatFit*, Lesson 2: What Are You Eating (CHKRC ID #1506) *Exercise Your Options!*, Lesson 5: Food Records (CHKRC ID #5331)	
Standards	**Science**	**Health** Essential Concepts Grades 7 and 8: 1.6.N Grades 7 and 8: 1.8.N Interpersonal Communication Grades 7 and 8: 4.1.N Practicing Health-Enhancing Behaviors Grades 7 and 8: 7.1.N

Activity	After students have learned the categories for classifying fruit, have them apply their categorization skills to classifying the *Harvest of the Month* featured produce. Can it be classified as a fruit? Which category? Based on other fruits in this category, which nutrients might be highest in this fruit? Which method of dispersal is most likely for this plant? Ask students to draw the plant cycle from flower, to fruit, to seed, and to growing a new plant.	
Resource	*Harvest of the Month* (CHKRC ID #5798) or http://www.harvestofthemonth.com	
Standards	**Science** Structure and Function in Living Systems 5a and f	**Health** Essential Concepts Grades 7 and 8: 1.6.N

Activity	Ask student teams to research the role of three of the nutrients contained in the fruit they investigated. Which body systems do they benefit? What are the benefits of these nutrients? What happens when someone is low in these nutrients? Student teams then create a superhero who depends on this fruit for superpowers. They write a comic strip that describes the superhero's super powers and how the superhero rescues a student in vitamin distress.	
Resource	*Planet Health*, Lesson 23: The Plants We Eat (CHKRC ID #1048)	
Standards	**Science** Structure and Function in Living Systems 5a	**Health** Essential Concepts Grades 7 and 8: 1.2.N Grades 7 and 8: 1.5.N Interpersonal Communication Grades 7 and 8: 4.1.N

Activity	Ask student teams to compare and contrast fruit "packages" with other favorite snack food and beverage packages (chips, sodas, cakes, cookies). How many servings are in each package? How many calories are consumed when the whole package is eaten? Ask students to set a short-term goal to substitute fruit snacks for favorite less-healthy snacks. Have students write the time period for the goal, specific substitutions they will make, and one way they plan to celebrate reaching their goal.	
Resource	*Power of Choice*, Topic 3: Helpings vs. Servings, Snacks—How Much in a Package? (CHKRC ID #1571)	
Standards	**Science**	**Health** Essential Concepts Grades 7 and 8: 1.6.N Goal Setting Grades 7 and 8: 6.1.N



Fruit Classification

Name:_____ **Date:**_____

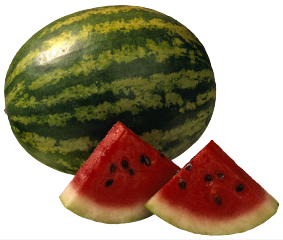
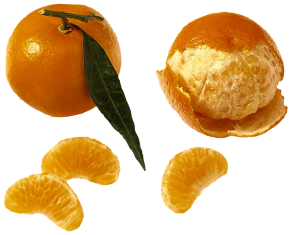
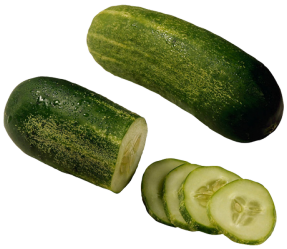
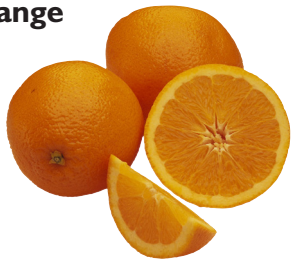
Review the descriptions of the eight botanical classifications below. Using the food pictures and these descriptions, write the fruit or fruits that your team decides to group in each classification. (Note: There may be more than one fruit for each classification.)

Botanical Classifaction	Description	Examples of Fruit in This Class	Fruit Picture Classification
1. Drupe	A simple fleshy fruit from one flower with one pistil. A drupe is juicy with one seed surrounded by a stony pit. (*Many drupes are made into jams*.)	*Coconut, apricot, cherry, peach, plum, olive*	
2. Berry	A simple fleshy fruit from one flower with one pistil. Usually the ovary is compound so the fruit contains many seeds. The skin is usually thin and the seeds are scattered around the inside. (*One berry is not particularly sweet and used in salads and sliced for hamburgers.)*	*Tomato, grape, persimmon, pepper, eggplant, banana*	
3. Pepo	Usually the ovary is compound so the fruit contains many seeds. The skin or rind is thick and often tough. (*One of these can get very large and in the fall can be carved to make faces.)*	*Pumpkin, watermelon, cucumber, squash, cantaloupe*	
4. Hesperidium	A simple fleshy fruit from one flower and one pistil. Usually the ovary is compound so the fruit contains many seeds. The skin is leathery and contains oils with distinct fragrances. (*One of these makes a common breakfast drink.)*	*All citrus fruits*	

Botanical Classifaction	Description	Examples of Fruit in This Class	Fruit Picture Classification
5. Pome	A simple fleshy fruit from one flower and one pistil. Usually the ovary is compound so the fruit contains many seeds. The seeds are in the center surrounded by a tough paper-like covering. (*One of these is often given to teachers and helps keep the doctor away.)*	*Apple, pear, quince*	
6. Aggregate Fruit	A simple fleshy fruit that develops from a single flower with many pistils. Each pistil develops into a tiny fruitlet. When mature these juice-filled fruitlets will cluster together to form a single fruit. (*Some of these are dark and make terrific jam!)*	*Raspberries, blackberries, strawberries*	
7. Legume	A simple fruit that is dry and hard when ripe. They may be sold before they are dry and so they are soft and green. The pod containing the seeds opens along two seams running their length. (*One kind is sold dry and we eat them at baseball games!)*	*Pea, bean, peanut*	
8. Achene	A simple fruit that is not fleshy. In markets they are sold dry. The seed separates from the outside that must split open along its seams to reveal a single seed inside. (*Students like to eat these but must find ways to discard the seed covers.)*	*Sunflower, buttercup, buckwheat*	

Fruit Classification Pictures

For each student team, copy and cut one set of fruit pictures into individual cards.

Watermelon 	**Apple** 	**Pear** 
Raspberry 	**Peanut** 	**Blackberry** 
Tangerine 	**Cucumber** 	**Sunflower Seed** 
Orange 		

Fruit Classification Answer Key:

Watermelon=Pepo, Apple=Pome, Raspberry=Aggregate Fruit, Peanut=Legume, Tangerine=Hesperidium, Cucumber=Pepo, Pear=Pome, Blackberry=Aggregate Fruit, Sunflower Seed=Achene, Orange=Hesperidium

Fruit Investigation

Name:_____ **Date:**_____

Names of Student Scientist Team Members

Note: *Every team member should have an assignment, and there may be more than one student assigned to one role.*

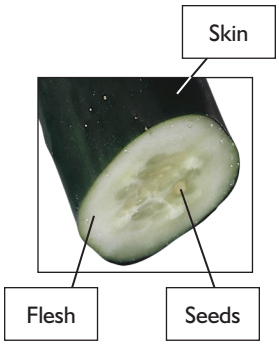
Material Coordinator:_____ Teamwork Facilitator:_____

Data Recorder:_____ Safety Coordinator:_____

Data Reporter:_____

Directions for the Investigation:

1. Follow the class knife and food safety directions.
2. Carefully examine one "mystery" fruit sample; note the shape, color, and peel of the fruit.
3. Place the fruit on the cutting board with the stem to your right. Cut the fruit in half. Observe the characteristics of the parts of the fruit noted in the illustration.
4. Determine the botanical classification of the fruit using the "Fruit Classification" student work sheet.
5. Draw the dissected fruit and label the parts: skin, flesh, and seeds (as illustrated).



Name of Fruit: _____

Fruit Classification: _____

Draw and label the dissected fruit:

Directions for Fruit Salad Preparation and Tasting:

1. After completing the dissection and botanical drawings, clean the cutting board, and ask all team members to wash their hands.
2. One team member washes and cuts one piece of fruit into one-inch pieces.
3. The material coordinator takes the prepared fruit to the teacher, and the teacher provides the correct classification of the fruit. The teacher will place all cut fruit in the class salad bowl and combine the salad gently. (Optional—include accompaniments for the salad such as yogurt, raisins, and animal crackers.)
4. Wait for the teacher to invite your team's material coordinator to get a small sample of salad for each team member.
5. Complete the questions below with your student scientist team.

Student Questions:

1. Did your team correctly classify the "mystery" fruit? ☐ Yes ☐ No ☐ We were close

2. How does dissection help with classifying and identifying fruits?

3. Why is it important to classify fruits and plants?

4. Think about how the seeds contained in the fruit are dispersed in nature. Give an example of how an animal may play an important role in carrying seeds to another location.

5. Why is seed dispersal important to the plant?

6. Use the scale below and rate the fruit salad prepared by the class:

★	★★	★★★	★★★★
Not sure.	It was okay.	I liked it!	One of my favorites!

7. Using the "Fruit Nutrient Information Sheet" provided by your teacher, what are the three nutrients that are highest in the fruit you investigated? Write a brief description of how these three nutrients impact health.

8. How would you use the fruit salad recipe to introduce your family or friends to new fruits and flavors and better health?

Flower Model Illustration

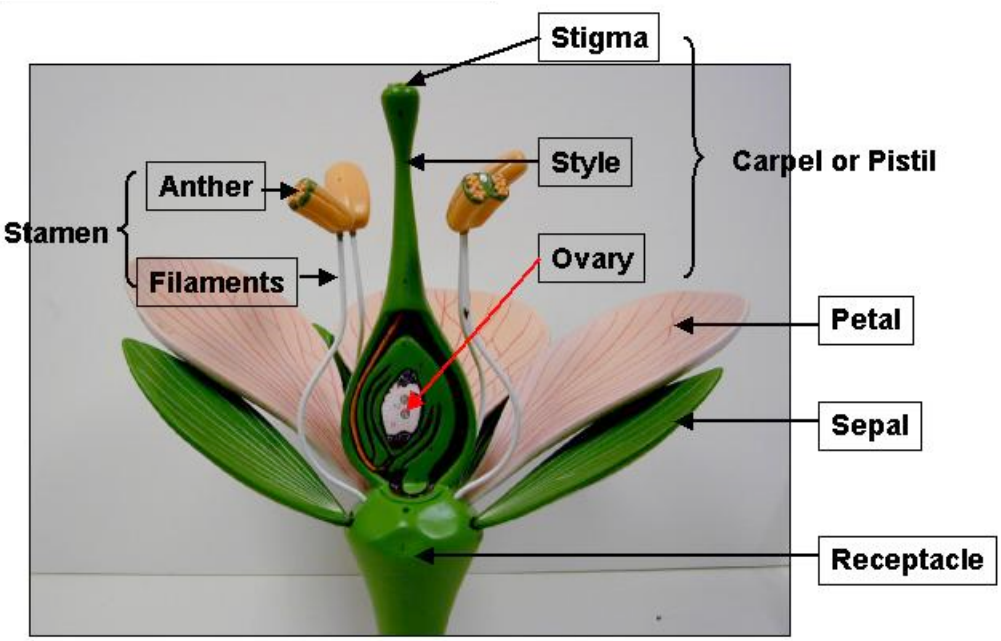


Illustration included with permission from Mike Huddleston, Biology Faculty,
North Lake College, Dallas County Community College District, Texas, United States of America.

Class Fruit Investigation

Student reporters write the name of the fruit their team investigated and the classification of the fruit. Later the teacher or reporters write the top three nutrients in the investigated fruit.

Recommended Fruit Intake

	Boys	Girls
Fruits	2 cups	1½ - 2 cups
Vegetables	2½ - 3 cups	2½ cups

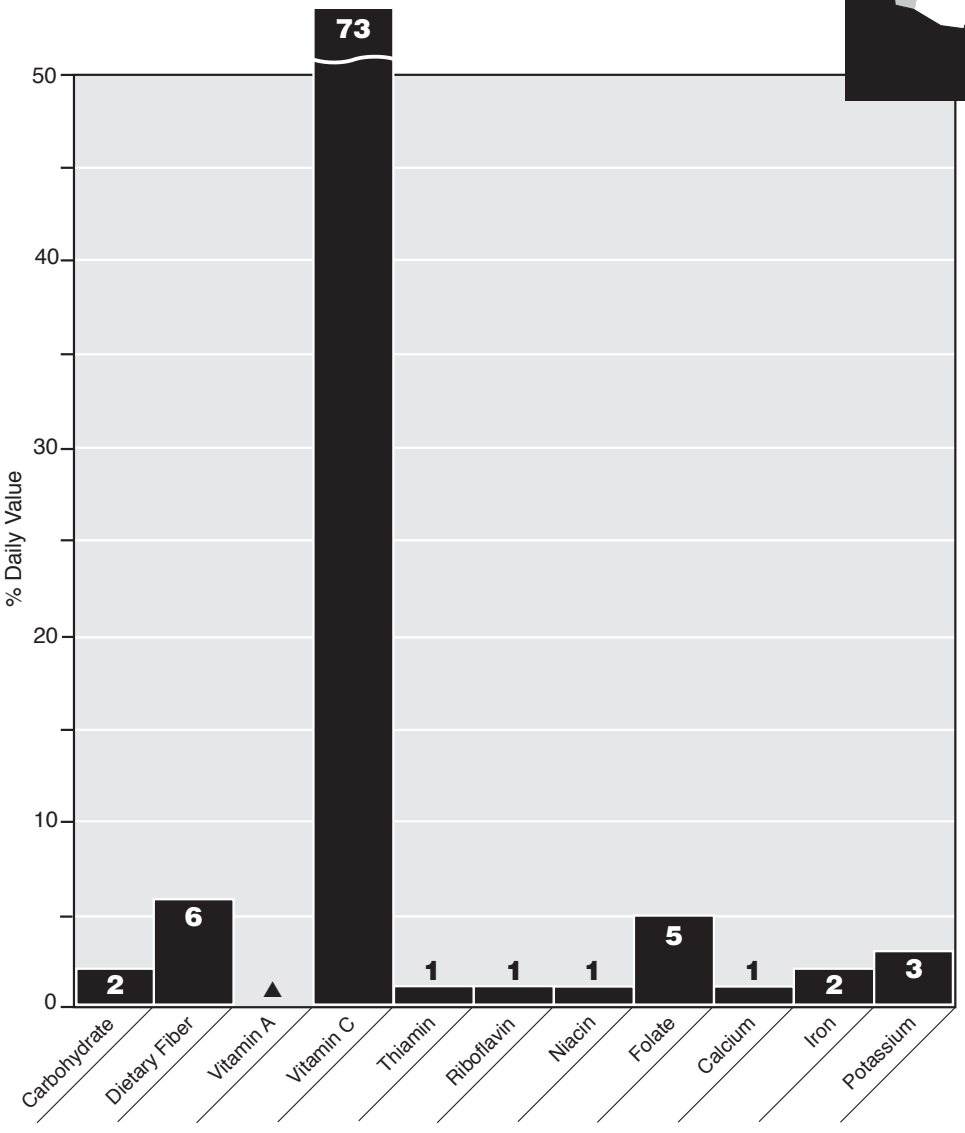
	Name of Fruit	Fruit Classification	3 Top Nutrients
Team One			**1.** **2.** **3.**
Team Two			**1.** **2.** **3.**
Team Three			**1.** **2.** **3.**
Team Four			**1.** **2.** **3.**
Team Five			**1.** **2.** **3.**

Fruit Nutrient Information Sheet

Additional fruit nutrient information sheets can be downloaded from the *Harvest of the Month* Web site, http://www.harvestofthemonth.com (See Educators' Corner).

Strawberry

Rosaceae *Fragaria ananassa*
(analysis based on raw strawberry)



Serving Size	
1/2	Cup
74	Grams
24	Calories
	8% from fat
	7% from protein
	85% from carbohydrate
0.5	Gram Protein
6	Grams Carbohydrate
	2 grams dietary fiber
0.2	Gram Fat
67	Grams Water
1	Milligram Sodium

▲ Trace

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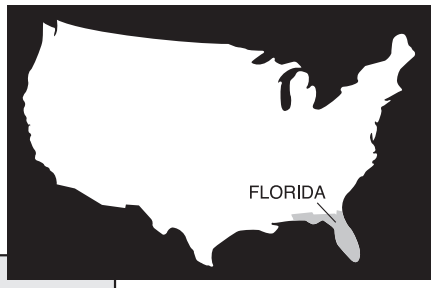
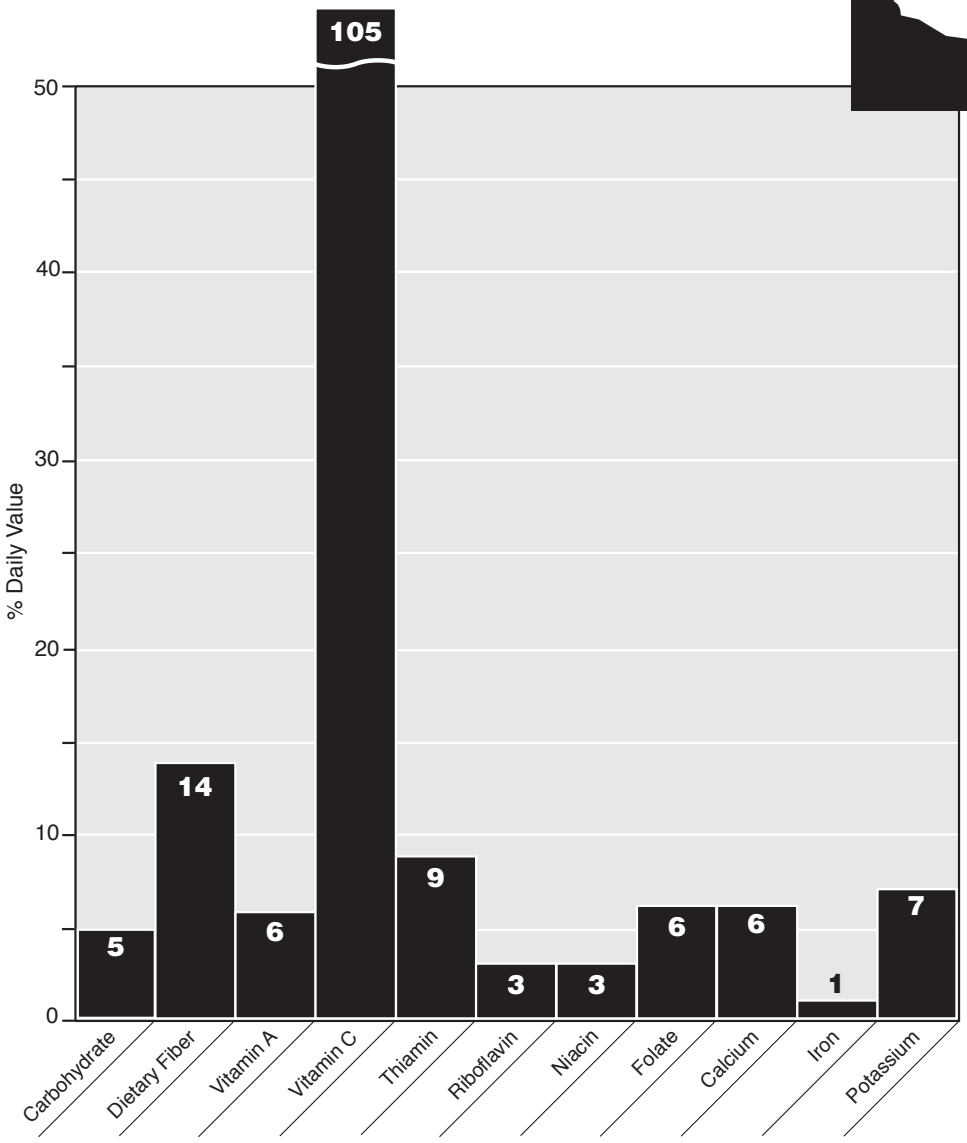
Fruit Nutrient Information Sheet

Orange

Rutaceae *Citrus sinensis*
(analysis based on *peeled* raw orange)
Pictured: Navel orange





Serving Size	
1	Medium Orange
140	Grams
64	Calories
	4% from fat
	5% from protein
	91% from carbohydrate
1	Gram Protein
16	Grams Carbohydrate
	3 grams dietary fiber
0.3	Gram Fat
122	Grams Water
0	Milligrams Sodium

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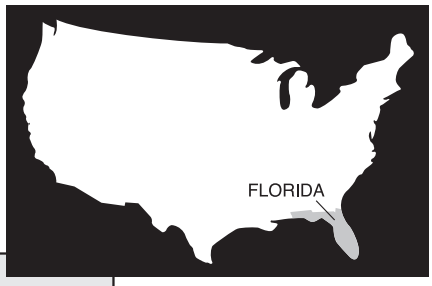
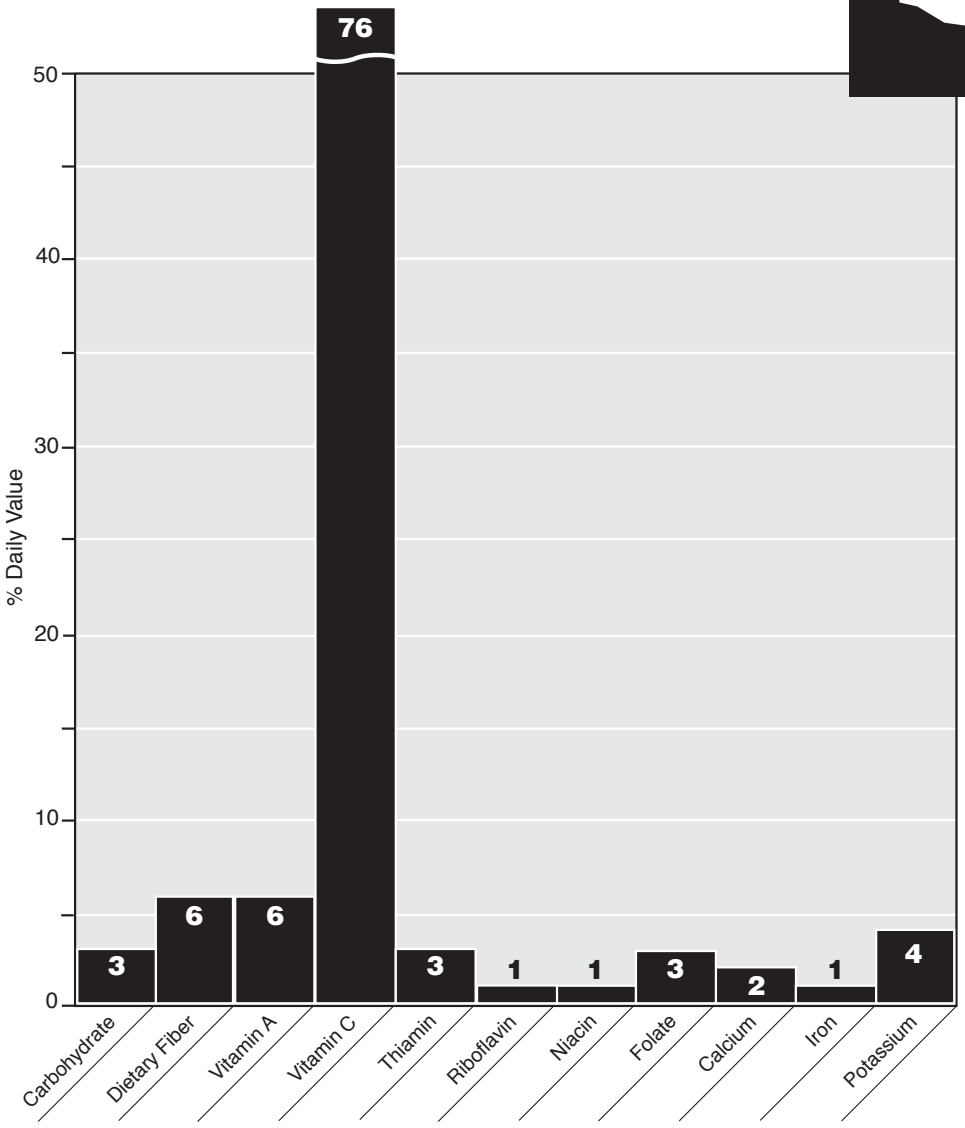
Fruit Nutrient Information Sheet

Grapefruit

Rutaceae *Citrus paradisi*
(analysis based on *peeled* raw pink and red grapefruit)
Pictured from top: white, pink (cut), Ruby Red (cut), Ruby Red grapefruits





Serving Size	
1/2	Medium Grapefruit
123	Grams
37	Calories
	3% from fat
	6% from protein
	90% from carbohydrate
1	Gram Protein
9	Grams Carbohydrate
	1 gram dietary fiber
0.1	Gram Fat
113	Grams Water
0	Milligrams Sodium

Red grapefruit has 2 times more vitamin A than pink; white grapefruit has only a trace of vitamin A.

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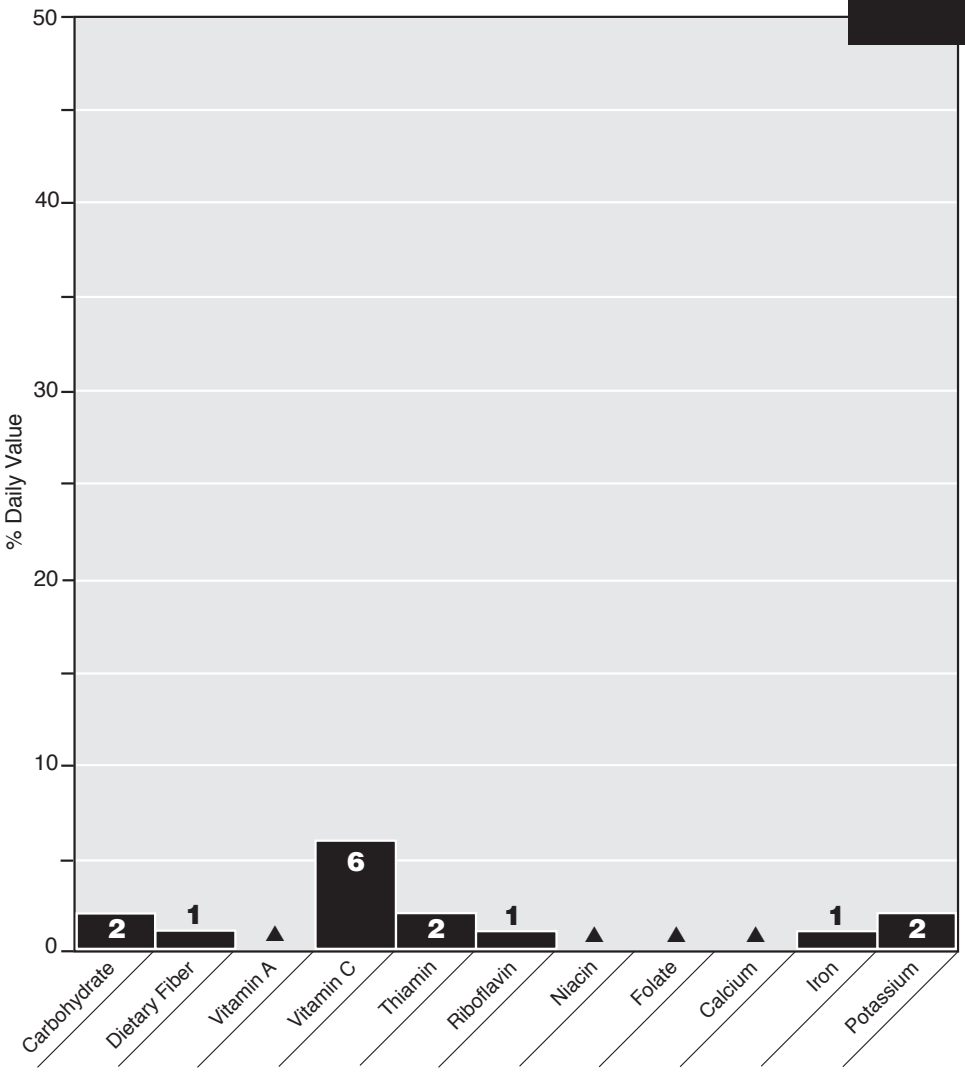
Fruit Nutrient Information Sheet

Grape

Vitaceae *Vitis vinifera*
(analysis based on raw table grape)
Pictured from top: Thompson seedless (green), Flame seedless (red), Ribier (purple) grapes



FRUIT

Serving Size	
15	Grapes
35	Grams
24	Calories
	2% from fat
	3% from protein
	94% from carbohydrate
0.3	Gram Protein
6	Grams Carbohydrate
	0.3 gram dietary fiber
0.1	Gram Fat
28	Grams Water
1	Milligram Sodium

▲ Trace

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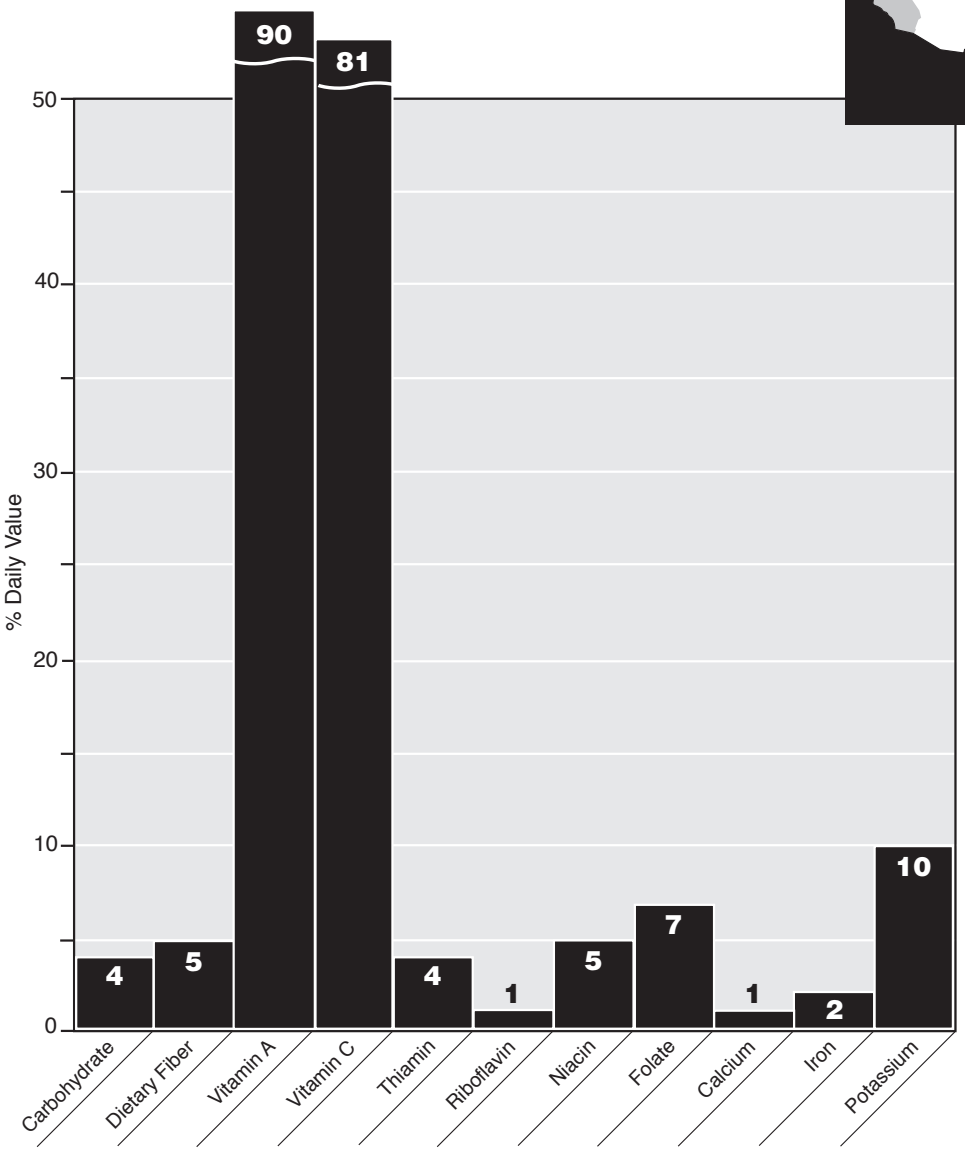
Fruit Nutrient Information Sheet

Cantaloupe

Cucurbitaceae *Cucumis melo*
(analysis based on *peeled* raw cantaloupe)



Serving Size

1/4	Medium Cantaloupe
132	Grams
45	Calories
	5% from fat
	8% from protein
	86% from carbohydrate
1	Gram Protein
11	Grams Carbohydrate
	1 gram dietary fiber
0.3	Gram Fat
119	Grams Water
21	Milligrams Sodium

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Inventing Fruit Products

Background

George Washington Carver was one of the nation's greatest educators, botanists, and agricultural researchers. His research resulted in 325 products from peanuts, more than 100 products from sweet potatoes, and hundreds more from a dozen other plants native to the South. These products helped to improve the rural economy by offering a variety of crops that were beneficial for the farmers and for the land.

Directions:

Inform student teams that their task is to "invent" a new healthy food product from the fruit they investigated.

- The new food product may be a juice blend, snack, or healthy energy drink.
- Each team will develop a presentation for an investor about the new product and the benefits of distributing this product. This presentation should include both oral and visual components, such as a poster or PowerPoint presentation.

Each team presentation includes:

- Proper citations for sources used to gather information.
- A name for the product.
- A description of the product.
- The kind of consumer who will use this product (e.g., adults, teens, families, mothers).
- An explanation of the nutrients in this product and how this product benefits consumers and farmers.
- A description of where this product would be distributed and strategies for encouraging the consumers to choose this product as a healthy choice.

Materials

- Samples of products made from fruit (if possible, include advertisements for the product)
- Poster board or access to computers
- Photos of fruit
- Paper
- Marking pens, crayons, colored pencils

Time and Performance Assessment

Provide teams time to create their presentations as a homework assignment, and to present their invention to the class. After each team presents their invention, ask students to complete a "Fruit Invention Presentation Review" form. Include student reviews in evaluating each team's performance.

References for Information About Fruit

- *Fresh Fruit and Vegetable Photo Cards* (CHKRC ID #6890)
- *Harvest of the Month* (CHKRC ID #5798) or http://www.harvestofthemonth.com

Fruit Invention Presentation Review

Name:_____ **Date:**_____

Presentation Reviews

Team Members (List names of presenters):_____

_____

_____

Title of Product:_____

Rate how well the team addressed the criteria (1 = Not Addressed to 5 = Great Job!)

Presentation Criteria	**1**	**2**	**3**	**4**	**5**
Described the product					
Identified the consumer who would buy this product					
Explained the nutrients and health benefits of the product					
Provided strategies for distributing the product and to encourage customers to buy the new product					

Overall comments on the presentation:

_____

_____

_____

_____

_____

_____

Glorious Guacamole

A vitamin is a substance that makes you ill if you don't eat it.

—Albert Szent-Gyorgyi

Background

Free radicals are the natural by-products of many processes in the human body. They are also created by exposure to environmental factors, including poisons, drugs, metals, cigarette smoke, car exhausts, heat, and even by sunlight. Free radicals try to capture electrons from other molecules, including proteins, lipids, carbohydrates, and DNA. When a molecule loses its electron to a free radical, it then becomes a free radical, and starts a chain reaction that can result in damage to cells and tissues.

The chemical reaction that produces free radicals is called oxidation. Antioxidants are substances that slow or prevent deterioration, damage, or destruction by oxidation. Beta-carotene, lycopene, and vitamins A, C, and E are some common antioxidants. These substances deactivate free radicals and may help to prevent damage to cells and tissues that can contribute to cancer, heart disease, and stroke.

Recommendations

Antioxidants are found in fruits and vegetables, as well as in other foods, including nuts, grains, and some meats, poultry, and fish. These are some food sources of common antioxidants:

- **Beta-carotene**—Foods that are orange in color, including sweet potatoes, carrots, cantaloupe, squash, apricots, pumpkin, and mangos; and some green leafy vegetables, including collard greens, spinach, and kale
- **Lycopene**—Tomatoes, watermelon, guava, papaya, apricots, pink grapefruit, and blood oranges
- **Vitamin A**—Liver, meat, milk, eggs, and cheese
- **Vitamin C** (ascorbic acid)—Limes, lemons, oranges, tangerines, grapefruit, broccoli, strawberries, bell peppers, potatoes, and melons
- **Vitamin E**—Oils, including wheat germ, sunflower, corn, and soybean; and it is also found in nuts, olives, spinach, and other leafy vegetables

How Schools Can Help

Students who participate in national school meal programs can have higher than average intakes of many nutrients. They are more likely to consume vegetables, milk and dairy products, and meat and other protein-rich foods, and to consume less soda or fruit drinks. Encouraging students to participate in these programs can contribute to increased calcium, iron, and vitamin C intakes, and overall healthier diets.

Resource Web Sites

***California Food Guide: Fulfilling the Dietary Guidelines for Americans*—http://www.cafoodguide.ca.gov**
This site provides a summary of federal and state dietary guidelines and describes how to apply them to daily intake. It is offered as a collaborative project between the California Department of Health Care Services, California Department of Public Health, and the Inter-Agency Nutrition Coordinating Council.

Centers for Disease Control and Prevention—Fruits and Veggies Matter
http://www.fruitsandveggiesmatter.gov
This online resource provides recipes, publications, benefits, portion sizes, and recommendations related to daily fruit and vegetable intake.

***2005 Dietary Guidelines for Americans*—http://www.health.gov/dietaryguidelines**
This site includes the full guidelines about dietary habits that can promote health and reduce risk for major chronic diseases. The appendixes include tables with nutrient and fiber content of many foods.

MedlinePlus—http://medlineplus.gov
This site brings together information from the National Library of Medicine, the National Institutes of Health (NIH) and health-related organizations to accurately answer questions about health, supplements, and nutrition.

Office of Dietary Supplements—http://ods.od.nih.gov
This Web site, provided by the National Institute of Health, offers information about vitamins and minerals, their function, food sources, and daily recommendations.

Grade Eight

Linking Lesson 11

Glorious Guacamole

Activity Overview

Student teams conduct experiments to determine which guacamole ingredients prevent oxidation and then learn about safe food handling.

Science Goal: Students will understand the methods for conducting an experiment involving oxidation reactions and their inhibitors and how to interpret the results of the investigation.

Nutrition Goal: Students will understand how vitamins can protect cells and prevent disease, why food safety is important, and be able to identify four food safety steps.

Content Standards and Skills Covered in This Lesson

California Science Standards

Grade Eight

Reactions

- 5a Students know reactant atoms and molecules interact to form products with different chemical properties.
- 5e Students know how to determine whether a solution is acidic, basic, or neutral.

Investigation and Experimentation

- 9a Plan and conduct a scientific investigation to test a hypothesis.
- 9b Evaluate the accuracy and reproducibility of data.
- 9c Distinguish between variable and controlled parameters in a test.

California Health Education Standards

Grades Seven and Eight

Essential Concepts

- 1.2.N Identify nutrients and their relationship to health.
- 1.3.N Examine the health risks caused by food contaminants.
- 1.4.N Describe how to keep food safe through proper food purchasing, preparation, and storage practices.
- 1.10.N Identify the impact of nutrition on chronic disease.

Practicing Health-Enhancing Behaviors

- 7.1.N Make healthy food choices in a variety of settings.
- 7.2.N Explain proper food handling safety when preparing meals and snacks.

Lesson Highlights

Materials Needed

- ❑ Video clip entitled, "Why Does the Avocado Turn Brown with Time?" from the *Linking Science and Nutrition* DVD (CHKRC ID #8210) or substitute sliced fruit (avocados, bananas, apples or pears) for the DVD video clip.
- ❑ Guacamole, mixed
- ❑ Poster of the Scientific Method
- ❑ For six student teams:
  - 12 ripe avocados
  - 6 small onions
  - 6 garlic cloves
  - 6 limes
  - 6 teaspoons of salt
  - 30 small bowls (five for each team)
  - pH paper (five-six pieces per team)
  - Plastic forks (five-six per team)
- ❑ Copies of student work sheets (one per student)
- ❑ Copies of the student assessment (one per team)

Preparation Time

30 minutes

Preparation Activities

- Slice fruit or avocado and leave out to oxidize (substitute for video).
- Make guacamole, using the recipe from the student work sheet.
- Slice twelve avocados in thirds.
- Dice six small onions.
- Mince six garlic cloves.
- Set-up six sets of each of the guacamole ingredients (one set for each team).
- Copy student work sheets.

Activity Time

90 minutes

Can be divided into two class periods:

Steps 1 to 4 (50 minutes) on day one
Steps 5 to 7 (40 minutes) on day two

Vocabulary (See the Glossary for definitions.)

Acid	Control	pH
Antioxidant	DNA	Product
Base	Hypothesis	Reactant
Chemical reaction	Oxidation	Variables

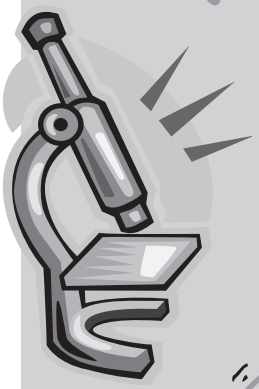
Steps for Classroom Activity

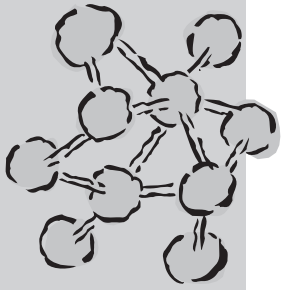
1) Warm-Up (5 minutes)

- Show the *Linking Science and Nutrition* DVD video clip entitled, "Why Does the Avocado Turn Brown with Time?" or demonstrate with an avocado half that has turned brown.
- Ask the students why the sliced avocado turns brown. *(Responses may include: The oxygen in the air combines with the open tissue of the avocado to form a chemical reaction. Browning is the result of this chemical reaction.)*
- Show students the guacamole.
- Ask the students why the guacamole did not turn brown. Conduct a teacher-led inquiry related to the question.
- Tell students that they will investigate the answer to this question in today's class.

2) Before the Investigation (10 minutes)

- Ask students the following questions to review content from science:
  - What is a chemical reaction? *(Responses may include: A process that results in the interconversion of chemical substances—two or more chemicals react together to form a new product.)*
  - What are reactants and products? *(Responses may include: The reactants are the chemicals that are combined together; the product is the result.)*
  - What are some of the ways that we can observe differences between the reactants and products? *(Responses may include: We can compare chemical and physical properties such as color, state [solid, liquid, and gas], smell, and pH.)*
  - Can we always see the difference? *(Responses may include: Usually the product looks different than either of the reactants, but there are many reactions that we cannot observe. An example is colorless gases.)*
  - What is an oxidation reaction? *(Responses may include: A chemical reaction resulting in the loss of an electron by a molecule, atom, or ion. An example is the oxidation of carbon to yield carbon dioxide.)*
  - Inform students that, like the avocado, oxidation reactions are happening all the time and they also occur in our body. Oxidation can damage DNA, cells, and tissues. During the experiment today, we will explore substances that may prevent or slow oxidation. Substances that prevent oxidation are called antioxidants.





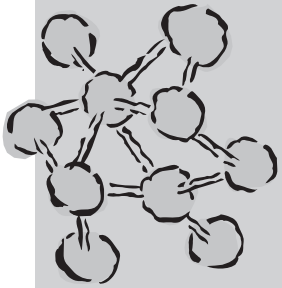
- Review the poster of the Scientific Method and the importance of a "control" to provide a reference for comparing the effects of the experimental treatment. Discuss the need for replication in scientific research. Replication of research can verify or disconfirm experiment results.
- Tell the students that today they will form student scientist teams and conduct an experiment to figure out what prevents the oxidative or browning reaction of the avocado in the guacamole.

3) Investigation (30 minutes)

- Divide the class into six student scientist teams (See "Tips for Success—Coordinating Student Scientist Teams," page 9).
- Give each student team a copy of the "Guacamole Investigation" student work sheet.
- Ask students to define hypothesis. *(Responses may include: An educated guess.)*
- Point out the ingredient list on the student work sheet, and have each team formulate and record a hypothesis about which ingredient in guacamole prevents browning.
- Have each team share their hypotheses and record them on the board.
- Ask students the following questions:
  - What is a pH scale? *(Responses may include: The pH scale measures the acidity or alkalinity of a solution. The pH scale ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic and one that is more than 7 is basic.)*
  - Are any of the ingredients listed on the student work sheet acidic or basic?
  - How would you know?
- Demonstrate the use of pH paper strips, and tell the students that they will test the pH of each ingredient.
- Ask students to suggest methods or scales to measure browning. Take suggestions for scales and select one *(e.g., a scale of "one to five" with "five" indicating the most browning and "one" the least browning)*.
- Review the "Guacamole Investigation" student work sheet instructions. Remind students to avoid contaminating the samples by using a clean fork each time they prepare a new sample.
- After students have prepared their samples, provide 10-15 minutes for the oxidation to occur. Refer back to the chart of the scientific method and ask students:
  - *What is the control for our experiment and why is it needed? (Responses may include: The control is the avocado with no added ingredients. A control is necessary to minimize alternate explanations for results of experiments.)*
  - *What are the variables? (Responses may include: The variables include the ingredients added to the avocado and the amount of browning observed.)*






4) The Results (5 minutes)

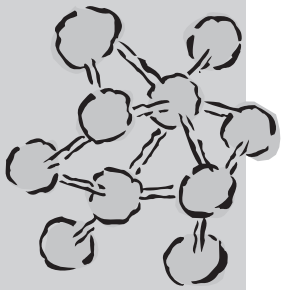
- Have student scientist teams share their findings from the experiment. The data reporter from each group describes the group results (e.g., which item had the highest pH, and which items browned the fastest and the slowest). Chart the groups' results in the "Class Guacamole Investigation Results" chart.

5) Science Discussion (5 minutes)

- Which ingredient is the most acidic? Which ingredient(s) stopped the avocado from browning (oxidizing)? *(Responses may include: The lime or lemon juice, the onion and garlic may also prevent some browning.)*
- Ask the students to discuss the results of the investigation. Did the results support their hypothesis?
- Did other teams find the same results?
- What characteristic did the ingredients that prevented browning share in common? *(Responses may include: The lemon or lime juice is the most acidic, onion and garlic may also have a low pH.)*
- Ask students to guess the compound that is in lemons or limes that prevents browning.

6) Nutrition Discussion (5 minutes)

- Explain that one of the compounds in the ingredients that prevented browning was vitamin C; this vitamin is an antioxidant. How does vitamin C protect our body? *(Responses may include: Vitamin C prevents oxidative damage to DNA and tissues and also functions in the body to support growth and repair tissues. Vitamin C is essential for the healing of wounds and for the repair and maintenance of cartilage, bones, and teeth.)*
- Vitamin C is one of many antioxidants that blocks some of the damage caused by free radicals. Our bodies are exposed to free radicals through pollution, smoking, and many other compounds in the environment.
- Ask students to share their responses to the other student work sheet questions. What other fruits and vegetables are high in vitamin C? Did they eat a fruit or vegetable that is high in vitamin C yesterday? How do they plan to include one vitamin C food daily?
- Ask students to name other antioxidants that can be found in food. *(Responses may include: Other antioxidants and foods include: vitamin E: whole grains and nuts; beta carotene: carrots, spinach, sweet potato; lycopene: tomatoes, watermelon; vitamin A: liver, eggs, fortified milk and cheese.)* Explain to the class that the best way to get the antioxidants and other nutrients needed is through food. Scientists are still discovering healthful compounds in foods.
- How could methods of food preparation impact antioxidants in foods? *(Responses may include: Some antioxidants can be lost or reduced when food is cut and left on the counter exposed to air. The amount of vitamin C in foods can also be reduced when foods are over cooked.)*



7) Closing (30 minutes)

- Food storage and preparation methods protect the quality and quantity of nutrients and antioxidants in foods, as well as the safety of the food. Ask the class, would these samples still be safe to eat? *(Responses may include: The foods have been left uncovered at room temperature. This decreases the amount of vitamin C in the samples, and increases the possibility that they are contaminated with harmful levels of bacteria and could be unsafe to eat.)*
- Tell students that, since this investigation involved the preparation of food, it is important that they learn about proper food handling.
- Ask students if they have ever had something to eat, and then felt sick with stomach cramps, nausea, diarrhea, vomiting, or a fever.
- Tell students that, if they experienced any of these symptoms after eating something, they most likely had food poisoning or contracted a food-borne illness. Food poisoning (foodborne illness) happens when foods or beverages have not been handled safely and become contaminated with dangerous levels of bacteria and germs.
- Distribute and review the "Being Food Safe" student work sheet. Ask students to complete the student work sheet and discuss the results.
- Have students complete the student assessment as a class assignment or on a separate day.

Ideas for Extending the Lesson

The activities listed below include resources that are available for a free, four-week loan from the California Healthy Kids Resource Center (CHKRC). Additional nutrition and physical activity DVDs, curricula, references, and displays can also be borrowed. To order materials or for other resource suggestions, check the CHKRC Web site at http://www.californiahealthykids.org or call toll free (888) 318-8188.

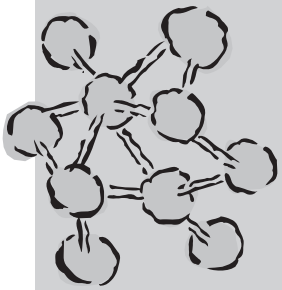
Activity	The Extension Activity—*DNA Defender Diner* extends students' knowledge of antioxidant-rich foods and how to handle foods safely. Students plan a healthy, antioxidant rich menu for a neighborhood restaurant. They name the restaurant, write food safety guidelines, and plan marketing strategies.	
Resource	See the Extension Activity "The DNA Defender Diner" with this lesson.	
Standards	**Science** Investigation and Experimentation 7a, c, and e	**Health** Essential Concepts Grades 7 and 8: 1.2.N Grades 7 and 8: 1.4.N Grades 7 and 8: 1.10.N Accessing Valid Information Grades 7 and 8: 3.1.N

2

Activity	Students conduct an experiment with vitamin C and apples and learn more about vitamins and their food sources. They learn about the functions of vitamins and antioxidants, and the symptoms of vitamin deficiencies.	
Resource	*Planet Health*, Lesson 23, The Plants We Eat. (CHKRC ID #1048)	
Standards	**Science** Investigation and Experimentation 7a, c, and e	**Health** Essential Concepts Grades 7 and 8: 1.1.N Grades 7 and 8: 1.2.N Grades 7 and 8:1.10.N

3

Activity	Students respond to quiz questions. Based on their responses, they set eating and fitness goals and work with students setting similar goals. Encourage students to include antioxidant-rich foods when setting their goals and to complete the eating and fitness contracts.	
Resource	*EatFit*, Lesson 2: What Are You Eating, Lesson 3, Get Psyched for Fitness (CHKRC ID #1506)	
Standards	**Science**	**Health** Essential Concepts Grades 7 and 8: 1.2.N Grades 7 and 8: 1.5.N Goal Setting Grades 7 and 8: 6.1.N



Guacamole Investigation

Name:_____ **Date:**_____

Guacamole Ingredients:

- 2 ripe avocados
- 1 small onion
- salt and pepper to taste
- 1 garlic clove
- 1½ tablespoons lime juice (or juice of one fresh lime)

Hypothesis (Which ingredient will prevent oxidation?):_____

Experiment Instructions:

1. Place one teaspoon of each of the following ingredients in four separate bowls:
   - onion
   - garlic
   - lime juice
   - salt
2. Add a small amount of water to the salt, onion, and garlic to create a solution to test the pH. Use pH paper to test the pH of each ingredient. Record the results below.
3. Add one piece of avocado to each of the ingredient bowls and combine ingredients thoroughly, use a clean fork each time.
4. Add the remaining slice of avocado to your sixth (empty) bowl and mash it with a clean fork.
5. Record the time the task was completed.
6. Let the bowls sit for 10-15 minutes or until browning is observed in the control sample. (The length of time for browning to occur varies with room temperature and ripeness of the avocado.)
7. Observe the color of each avocado mixture compared to the control (avocado alone). Record the final time and rate of the amount of browning on the chart below. A scale of "1-5" can be used with "1" indicating no browning and "5" indicating the most browning.

	Control	Onion	Lime	Garlic	Salt
pH					
Completed Preparation (Record the time. Describe the mixture and rate the browning.)					
Completed Experiment (Record the time. Describe the mixture and rate the browning.)					

Investigation Questions:

1. Was your hypothesis correct? ☐ Yes ☐ No

   Compare your hypothesis with the results of the experiment:_____

   _____

2. Which ingredient was most acidic (the lowest pH)? _____

3. What is this acidic compound? _____

4. Vitamin C may prevent _____and protect our bodies from _____

   _____

5. With your team, brainstorm food sources of vitamin C and list them here:

   _____

   _____

6. Complete the table below.

Yesterday, I ate these fruits and vegetables: (Write the names of the fruits and vegetables eaten and circle those high in vitamin C.)
Everyone should aim to have at least one good source of vitamin C daily. Write down two or more vitamin C-rich foods that you plan to eat this week.

Class Guacamole Investigation Results

		Control	Onion	Lime	Garlic	Salt
Team 1	pH					
	Rate the Browning					
Team 2	pH					
	Rate the Browning					
Team 3	pH					
	Rate the Browning					
Team 4	pH					
	Rate the Browning					
Team 5	pH					
	Rate the Browning					
Team 6	pH					
	Rate the Browning					

Being Food Safe

Each year, approximately one-third of the United States population has mild to severe cases of foodborne illnesses—and some people die from them.

Four serious foodborne illnesses include:

- ***Salmonellosis***, which you can get from contaminated water, kitchen surfaces, eggs, raw chicken, seafood, and other meats.
- ***Botulism***, which you can get from home-canned foods with low acid content, such as asparagus, green beans, beets, and corn.
- ***E-coli***, which you can get from undercooked meat, especially hamburger.
- ***Gastroenteritis***, which you can get from food that has been contaminated by food preparers or handlers with gastroenteritis, especially if they do not wash their hands regularly.

Four simple steps to help minimize risk of foodborne illness include:

- **Step 1: Clean hands and surfaces.** Always wash your hands before you touch food. To wash your hands correctly, you should lather up with soap and very warm to hot water; wash the front and back of the hands, in between each finger, under your fingernails, and up to your wrists; and rinse with very warm to hot water. Always wash cutting boards, dishes, utensils, and counter tops with hot soapy water after preparing each food item and before you prepare the next food item.
- **Step 2: Separate, don't cross contaminate foods.** Separate foods during preparation so that you don't cross contaminate the food. Cross-contamination happens when germs spread from one food to another.
- **Step 3: Cook foods at the proper temperature.** Cooking food at the proper temperature, and at a high enough temperature, can kill harmful germs that cause foodborne illnesses like E-coli.
- **Step 4: Chill or refrigerate promptly.** Cold temperatures keep germs from growing and multiplying, which is why you should promptly refrigerate foods you purchase from the grocery store, as well as any leftovers.

Glorious Guacamole and Food Safety

Use the information from your team's investigation and this student work sheet to respond to the following questions:

1. Which of the four kinds of foodborne illnesses could be caused by guacamole that is not prepared safely? Choose one illness and describe how guacamole could be contaminated and cause this illness.

2. If the guacamole was being prepared for the class to eat, which of the four food safety steps would be important to follow?

3. Review the guacamole recipe below and write in additional, simple food safety tips to ensure the guacamole is safe to eat. Include appropriate food safety tips below each step on the recipe directions.

Glorious Guacamole—Food Safe Recipe

Ingredients

- 2 ripe avocados
- 1 small onion
- 1 garlic clove
- 1½ tablespoons lime juice (or juice of one fresh lime)
- salt and pepper to taste

Directions

1. Cut the two avocados in pieces and mash with a fork.

2. Dice the small onion and the garlic clove.

3. Squeeze the lime juice.

4. Add the onion, garlic, lime juice, and salt and pepper to the avocado and mix thoroughly.

5. Serve and enjoy.

Working as a Team

Name:_____ **Date:**_____

1. Did we do our job well?

Directions: For each member of the team, fill in one to three tasks that the team member performed during the activity. For each task, give a ranking from "1-5" ("1" is needing improvement, "5" is excellent job) to rate how well the task was completed and then suggest at least one way that the task could be improved.

Duties	Ranking "1-5"	Ways to Improve
Safety Coordinator		
1.		
2.		
3.		
Data Recorder		
1.		
2.		
3.		
Material Coordinator		
1.		
2.		
3.		
Data Reporter		
1.		
2.		
3.		
Teamwork Facilitator		
1.		
2.		
3.		

II. Working together

Directions: For each statement, check the box for True or False.

	True	False
1. Our team worked together smoothly and everyone contributed.		
2. Our team communicated well and treated each other with consideration.		
3. Some of our team members helped other team members understand the investigation better.		
4. When problems or questions came up, we were able to solve them together.		
5. Everyone on our team contributed equally to our work.		

III. What we learned

Directions: Check the box next to each statement that indicates whether your group could teach this concept to a friend that is not in your class.

Concept	Yes	Somewhat	No
1. The reactants and products in oxidation reactions.			
2. How to measure pH.			
3. An example of a controlled experiment involving oxidation reactions.			
4. The biological importance of oxidation.			
5. The importance of an antioxidant-rich diet and food safety to health.			

IV. What we would like to know

Directions: In the space provided, write three questions that your group has about antioxidants, chemistry, health, or food safety.

DNA Defender Diner

Extension Overview

Student teams work collaboratively to research and create a business entitled, "DNA Defender Diner." The diner is devoted to serving foods rich in antioxidants. Students identify antioxidant-rich produce using Internet or print research. Teams create a name for their restaurant and develop a menu with appetizer, main course, beverage, and dessert sections. They also create a graphic design, skit, or video advertisement for the restaurant. If time allows, teams host a restaurant open house featuring some of the menu items.

Content Standards Covered in This Activity

California Science Standards

Grade Eight

Chemistry of Living Systems (Life Sciences)

6c Students know that living organisms have many different kinds of molecules, including small ones such as water and salt, and very large ones, such as carbohydrates, fats, proteins, and DNA.

California Health Education Standards

Grades Seven and Eight

Essential Concepts

1.2.N Identify nutrients and their relationship to health.

1.4.N Describe how to keep food safe through proper food purchasing, preparation, and storage practices.

1.10.N Identify the impact nutrition has on chronic disease.

Accessing Valid Information

3.1.N Distinguish between valid and invalid sources of nutrition information.

Practice Health-Enhancing Behaviors

7.2.N Explain proper food handling safety when preparing meals and snacks.

Health Promotion

8.3.N Encourage peers to eat healthy foods and be physically active.

Lesson Highlights

Materials Needed

- ❑ Sample restaurant menus
- ❑ Copies of student work sheet (one per student team)
- ❑ Internet access
- ❑ Poster board, marking pens, audiovisual equipment (optional)
- ❑ Computer with graphics and color printer
- ❑ Optional: food and cooking supplies for reception, audio and video production equipment, art supplies for menu and posters, decorations for the reception

Activity Time

95 minutes

This extension can be conducted in two to three days:

Steps 1 to 3 (30 minutes) on day one

Step 3 outside of class or provide time over one to two class days

Steps 4 to 7 (65 minutes) on day two

Steps for Classroom Activity

1) Warm-Up (10 minutes)

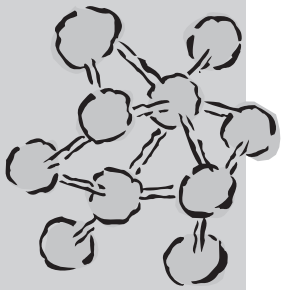
- In "Glorious Guacamole," we discovered that antioxidant-rich foods can be delicious.
- Brainstorm and list other foods rich in antioxidants. *(Responses may include: Other antioxidant-rich foods, include: vitamin E: whole grains and nuts; beta carotene: carrots, spinach, sweet potato; lycopene: tomatoes and watermelon; vitamin A: liver, eggs, fortified milk and cheese.)*
- How do antioxidant-rich foods protect health? *(Responses may include: Antioxidant-rich foods can help neutralize harmful compounds. These harmful compounds can damage DNA, cells, and tissues that may lead to cancer and plaque in arteries.)*
- Many neighborhoods have fast-food restaurants. Ask students to name fast-food restaurants in their area. How many fast-food ingredients are rich in antioxidants?
- Discuss the health consequences of eating mainly fast-food diets. *(Responses may include: Fast foods are low in antioxidants and high in fat, salt, and sugar. Populations that primarily eat these kinds of diets are at higher risk of diseases such as cancer, diabetes, and heart disease.)*
- What healthier alternatives would you offer in a neighborhood restaurant?

2) Before the Investigation (10 minutes)

- Introduce the assignment and inform the class that they are going to create a restaurant in which every dish is rich in antioxidants. The restaurant, called the *DNA Defender Diner*, will protect its community from oxidation damage while serving tasty foods.
- Student teams will create a menu with menu-style descriptions. The teams are to include art, graphic design, or stylized text in the menu design.
- In addition to the menu, the new restaurant will need to be marketed. Each team will also create a poster, video, skit, print advertisement, or song to help market the restaurant to teens. All advertisements will contain three pieces of factual information about the health benefits of antioxidants and where they are found.
- Distribute the "DNA Defender Diner Plan" student work sheet, and review the instructions.

3) Investigation (Assign as homework or provide class time over one to two days.)

- Group students into restaurant planning teams, and ask them to write the names of the team members on the student work sheet.
- Before starting work, conduct a large group discussion around the questions, "What does your group need to accomplish this project?" "How will your team work on this project?" *(Assign individuals or work as a team.)*



- Supply teams with sample menus, a list of valid Web sites for research (include the sites listed in the "Resource Web Sites" section at the start of this lesson), Internet access, and materials needed to complete the assignment.
- Give student teams class time or time outside of class to complete the assignment.

4) The Results (35-40 minutes)

- Give each student team five minutes to present their restaurant concept, menu, food safety guidelines, and marketing materials.
- After each group presentation, lead a group discussion about how well each group accomplished the assignment (naming the restaurant, creating the menu, writing food safety guidelines, and developing marketing tools).

5) Nutrition Discussion (10 minutes)

Lead a class discussion about the following questions:

- Which restaurant was most appealing? What was your favorite menu item?
- Which items do you already eat? Are there any new foods that you plan to try?
- Which form of advertising was most compelling to you? Why?
- What would your team do differently to improve the final product or food safety?

6) Science Discussion (10 minutes)

Lead a class discussion about the following questions:

- How could communities benefit from having your restaurant in their area?
- What other rules or factors would decrease your customers' exposure to free radicals and oxidative damage? *(Responses may include: Limiting trans fats in foods, serving foods that are washed well or are grown with limited amounts of pesticides, not allowing smoking, and including umbrellas for outside diners.)*
- Why are there laws that prohibit smoking in restaurants, while there aren't rules about serving more antioxidant-rich foods?

7) Closing (5 minutes)

- What foods from the menu are easily prepared and readily available to eat on a regular basis?
- Ask students to formulate a personal antioxidant-rich breakfast or snack menu using food items from the menus presented that is easy to prepare and accessible to them. Discuss who would shop and prepare these meals or snacks, and how students could positively influence their family or caregivers to try these foods.
- Optional: After the student teams present their menu and advertisement, the class plans a reception that features items from each menu. Students obtain real recipes for the menu items, and plan shopping, cooking, and service for the reception. The class invites another class and the principal to the reception to encourage healthier eating in their school community.

DNA Defender Diner Plan

Name:_____ **Date:**_____

Names of Student Scientist Team Members:

List the names of your team members below. Select one or two students to facilitate the group. All team members should research and summarize information to answer the questions and to prepare for the class presentation.

Group Facilitator:_____ Teamwork Facilitator:_____

Name:_____ Name:_____

Name:_____ Name:_____

Directions:

1. **Restaurant Name**
   Brainstorm and agree on a restaurant name and write it in the space below.

   _____

2. **Location and Clientele**
   Describe the restaurant location and target clientele (e.g., teens, families, young children).

   _____

   _____

3. **Menu**
   Choose items for the restaurant menu including at least two appetizers, two main courses, three beverages, and two desserts (low in fat and sugar). List the items below.

   Appetizers: _____ _____

   Main Courses: _____ _____

   Beverages: _____ _____ _____

   Desserts: _____ _____

4. **Design a Restaurant Menu**
   Create an inviting menu for customers. Include a colorful design and three sections: 1) why you started the restaurant, 2) the benefits of eating at your restaurant, and 3) the menu items with mouth-watering descriptions. Use a computer or draw the menu.
5. **Develop Food Safety Guidelines**
   Restaurants are regularly inspected to prevent foodborne illness. List the guidelines your employees will follow to pass inspection and to keep food safe for customers. List the guidelines on a poster for prominent display.
6. **Create a Marketing Campaign**
   Design a PowerPoint presentation, poster, video, radio announcement or other method of marketing your restaurant. Include the location, the customer audience, and three pieces of factual information about the health benefits of antioxidants on the menu and their food sources.

Fast-Food Frenzy

In 2002, almost 30 percent of California teens reported consuming fast food on the previous day.

–California Food Guide: Fulfilling the Dietary Guidelines for Americans

Background

Fast food provides a quick, convenient, and often peer-approved way of eating. In addition, it usually is inexpensive. Fast food costs less because it is frequently made with cheaper ingredients such as refined grains, added sugar and fats, and high-fat meats, instead of nutritious foods such as fresh fruits and vegetables, whole grains, and lean meats.

Recommendations

Is fast food bad? There is no such thing as a "bad" food. All foods can fit into a healthy lifestyle. Although fast food is usually high in fat, calories, cholesterol, and sodium, eating it once in a while, and learning to find healthier options will reduce negative health consequences.

The table below provides recommended estimated daily intakes based on the Institute of Medicine of the National Academies Food and Nutrition Board, Dietary Reference Intakes (DRI) for boys and girls fourteen to eighteen, and the *2005 Dietary Guidelines for Americans*. These amounts are averaged and vary with levels of activity and growth status.

Nutrient	Girls (14-18 years)	Boys (14-18 years)
Energy (kcals/day)	2,368	3,152
Carbohydrate (grams/day)	130	130
Protein (grams/day)	46	52
Total Fat (grams/day) (25 percent to 35 percent of calories)	65 - 92	87 - 122
Sodium (milligrams/day)	<2,300	<2,300

How Schools Can Help

Decreasing open campuses and the use of fast-food contractors, can increase student access to healthy food choices. State legislation and school wellness policies are beginning to address ways to reduce the influence of fast-food marketing. Providing standards-based nutrition education, and monitoring and implementing existing policies, can improve food choices and provide healthier options.

Resource Web Sites

***California Food Guide: Fulfilling the Dietary Guidelines for Americans*—http://www.cafoodguide.ca.gov**
This site provides a summary of federal and state dietary guidelines and describes how to apply them to daily intake. It is offered as a collaborative project between the California Department of Health Care Services, California Department of Public Health, and the Inter-Agency Nutrition Coordinating Council.

Center for Young Women's Health—http://www.youngwomenshealth.org
This site is sponsored by the Children's Hospital Boston. It includes teen friendly facts and recommendations for nutrition and fitness and for many other health topic areas.

***2005 Dietary Guidelines for Americans*—http://www.health.gov/dietaryguidelines**
This site includes the full guidelines, with research-based advice, about dietary habits that can promote health and reduce risk for major chronic diseases. The guidelines also serve as the basis for federal food and nutrition education programs.

Institute of Medicine of the National Academies (IOM)—http://www.iom.edu
The Web site includes reports, events, and projects on food and health. The IOM serves as adviser to the nation to improve health. It provides evidence-based information and advice concerning health and science policy to every sector of society and the public.

MyPyramid—http://www.mypyramid.gov
This online resource, from the United States Department of Agriculture, features personalized eating plans, interactive tools, classroom materials, posters, brochures, and advice for making food choices from every food group.

NutritionData—http://www.nutritiondata.com
This site offers nutrient information for many foods found in restaurants and produced by food manufacturers. The information in the database comes from the *United States Department of Agriculture's National Nutrient Database for Standard Reference*.

Grade Eight

Linking Lesson 12

Fast-Food Frenzy

Activity Overview

Student teams research popular fast-food restaurants and evaluate the nutritional value of foods served. Then based on the recommended number of calories and nutrients per day, students put together three balanced fast-food meals that meet, but do not exceed, the recommended number of calories and nutrients.

Science Goal: Students are able to develop and interpret information in graphs.

Nutrition Goal: Students are able to identify healthy food options when eating out.

Content Standards and Skills Covered in This Lesson

California Science Standards

Grade Eight

Chemistry of Living Systems

6c Students know that living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins, and DNA.

Investigation and Experimentation

9e Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.

California Health Education Standards

Grades Seven and Eight

Essential Concepts

1.2.N Identify nutrients and their relationships to health.

1.5.N Differentiate between diets that are health-promoting and diets linked to disease.

1.6.N Analyze the caloric and nutritional value of foods and beverages.

Accessing Valid Information

3.3.N Describe how to access nutrition information about food offered in restaurants in one's community.

Practicing Health-Enhancing Behaviors

7.1.N Make healthy food choices in a variety of settings.

Cross-Disciplinary Skills

- Researching
- Evaluating
- Recording and Comparing Data
- Communicating Results
- Writing Reports

Lesson Highlights

Materials Needed

- ❑ Nutritional information from popular fast-food restaurants or access to this information via the Internet. Refer to Web sites listed in the "Resource Web Sites" section of this lesson or ask students to collect this information from local restaurants.
- ❑ Copies of student work sheets (one per student)

Preparation Time

10 minutes

Preparation Activities

- Make copies of the student work sheets (one per student).
- Create two tables on the board or on flip chart paper as depicted in the class summary chart. Label one "less healthy" and the other "most healthy."

Activity Time

80 minutes

This activity can be conducted over two days:

Steps 1 to 4 (50 minutes) on day one
Steps 5 to 7 (30 minutes) on day two

Vocabulary (See the Glossary for definitions.)

Calorie	Mineral	Simple carbohydrate
Carbohydrate	Nutrient	Trans fat
Complex carbohydrate	Protein	Unsaturated fat
Fat	Saturated fat	Vitamin

Steps for Classroom Activity

1) Warm-Up (5 minutes)

- Ask students to take out a sheet of paper and list as many fast-food restaurants as they can in 30 seconds.
- Determine who listed the most and ask that student to read aloud his or her list. Record responses on the board.
- Ask the class if there are any fast-food restaurants that this person did not list. Record responses.
- Ask students to raise their hands if they eat at a fast-food restaurant once a day, once a week, once a month, or never. Record numbers on the board.
- Ask students to give reasons that they eat at fast-food restaurants.

2) Before the Investigation (10 minutes)

- Divide the class into student scientist teams of five to six students. Have students select their role within their team and write the names and roles on their student work sheets (See "Tips for Success—Coordinating Student Scientist Teams," page 9).
- Distribute the student work sheet, "All About Six Major Nutrients Your Body Needs," and assign each team one nutrient to review and report on.
- Tell the students that today they will work in these teams to explore one nutrient and to investigate the nutritional value of foods served at familiar fast-food restaurants.
- Ask students to determine the least-healthy and most-healthy food items at the fast-food restaurant they investigate. Instruct each team to put together three balanced meals that meet, but do not exceed, the recommended number of calories and nutrients for a student their age.

3) Investigation (30 minutes)

- Provide each team with nutritional information from a fast-food restaurant.
- Distribute the "Fast-Food Investigation" student work sheet to each team member.
- Have each team record the name of their fast-food restaurant on their student work sheet and then complete the student work sheet.

4) The Results (5 minutes)

- Ask each student team data reporter to present the team's least and most healthy food items. Record information on the "Class Fast-Food Summary" chart.

5) Science Discussion (10 minutes)

- Assign each student team a nutrient, and ask each team to use the "Class Fast-Food Summary" charts to create a bar graph that compares the quantity of that nutrient in at least five different foods.
- Ask students which restaurant food item is highest in fat and which food item is highest in calories. Which restaurant serves foods highest in fat and calories?
- Ask student which restaurant food item is lowest in fat, which is lowest in calories, and which is lowest in sodium. Which restaurant serves foods lowest in fat and sodium?

6) Nutrition Discussion (10 minutes)

- Discuss the following questions with student teams:
  - How many teams were able to put together three meals at your fast-food restaurant that met the nutrient and calorie requirements?
  - Was this task easy or hard? Explain why.
  - Were you surprised by what you learned about the nutritional value of some of the fast foods?
  - What recommendations do you have for people who often eat at fast-food restaurants?

7) Closing (10 minutes)

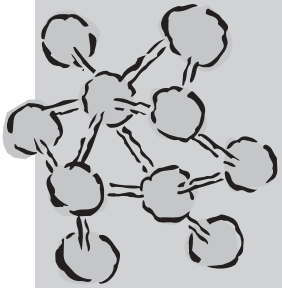
- Ask students how their fast-food restaurant research influences their decisions to eat at fast-food restaurants. Ask students to raise their hands if they plan to eat at a fast-food restaurant once a day, once a week, once a month, or never. Record numbers on board. Discuss how these numbers changed from the first count.
- Ask students to name internal and external influences (taste, peers, commercials, finances) that create barriers to changing fast-food eating habits. Which influence(s) poses the biggest challenge? Have student teams brainstorm ways to overcome these challenges.
- Ask students to complete the last question on the "Fast-Food Investigation" student work sheet. Remind students that this question is for their information only. Encourage students to work toward small changes and ask for help from friends, family, and others willing to help.
- Complete the student assessment at the close of the lesson, as homework,

Ideas for Extending the Lesson

The activities listed below include resources that are available for a free, four-week loan from the California Healthy Kids Resource Center (CHKRC). Additional nutrition and physical activity DVDs, curricula, references, and displays can also be borrowed. To order materials or for other resource suggestions, check the CHKRC Web site at http://www.californiahealthykids.org or call toll free (888) 318-8188.

Activity	Students explore the amount of different types of fat in fast food and other food items by calculating the percentage of fat in two diets. They use bar graphs to compare the total fat and saturated fat in the diets.	
Resource	*Planet Health*, Middle School—Lesson 12: Figuring Out Fat (CHKRC ID #1048)	
Standards	**Science** Investigation and Experimentation 9e	**Health** Essential Concepts Grades 7 and 8: 1.5.N Grades 7 and 8: 1.6.N

Activity	Student teams review nutrients in fast food as they compete in a tic-tac-toe game. They visually discover the quantity of fat in common fast foods and discuss ways to choose fast food that helps them meet healthy nutrition goals.	
Resource	*EatFit*, Middle School—Lesson 8: EatFit@Fast Food (CHKRC ID #1506)	
Standards	**Science** Investigation and Experimentation 9b	**Health** Essential Concepts Grades 7 and 8: 1.6.N



Activity	Using nutrition fact cards, students compare calcium and other nutrients in fast-food choices. They practice finding healthier options in fast-food restaurants, create an advertisement for healthful fast-food eating, and make a simple and quick healthy pizza.	
Resource	*Power of Choice, The*, Middle School—Lesson 8: Your Fast Food Order? (CHKRC ID #1571)	
Standards	**Science**	**Health** Essential Concepts Grades 7 and 8:: 1.5.N Grades 7 and 8: 1.6.N Practicing Health-Enhancing Behaviors Grades 7 and 8: 7.1.N Health Promotion Grades 7 and 8: 8.3.N

All About Six Major Nutrients Your Body Needs

Name:_____ **Date:**_____

Names of Student Scientist Team Members

Note: Every team member should have an assignment, and there may be more than one student assigned to one role.

Material Coordinator:_____ Teamwork Facilitator:_____

Data Recorder:_____ Safety Coordinator:_____

Data Reporter:_____

Your team will be assigned one nutrient to review and present to the class.

Nutrient assigned to your team: _____

Nutrient Information

Protein

Your muscles, skin, nails, and hair are mostly proteins. Protein is important because it:

- Helps you grow.
- Helps you build and maintain your strength.
- Builds and repair cells in your body.
- Fights off infections.
- Supplies your body with energy.

Sources of protein include lean red meat, chicken, fish, nuts, and legumes. Dairy products like cheese and milk are also good sources of protein.

Most people usually consume much more protein than they need. The recommended average daily amount of protein for teens fourteen to eighteen years is 46 grams for girls and 52 grams for boys. The amount needed may increase due to growth and activity level.

Carbohydrate

These nutrients are our main source of energy. Total carbohydrates include simple carbohydrates, complex carbohydrates, and fiber.

Simple carbohydrates are sugars that provide quick energy and very few vitamins or minerals. Complex carbohydrates, such as starches and fiber, provide your body with long-lasting energy. Foods with starch include pasta, bread, and potatoes.

Most of the calories you eat should come from complex carbohydrates (whole grains). The average recommended amount of carbohydrates for a student fourteen to eighteen years is 130 grams.

Fat

This nutrient provides long-lasting energy; helps the body store vitamins; helps protect vital organs like your heart, kidneys, and liver; and helps keep your body warm. There are three different kinds of fat: saturated, unsaturated, and trans fat.

Saturated fats come from dairy products, meats and poultry, and solid vegetable oils. You can tell if a fat is saturated if it is solid at room temperature, but melts to a liquid when heated. Eating foods that are high in saturated fats can increase your risk of developing heart disease.

Unsaturated fats are found in plant products like vegetables oils, most nuts, olives, avocados, and fatty fish like salmon. This type of fat is usually liquid at room temperature. There are two types of unsaturated fats: polyunsaturated and monounsaturated. Including these fats, instead of saturated or trans fats, may decrease your risk of developing heart disease.

Trans fat is made when manufacturers add hydrogen to vegetable oil in a process called hydrogenation. Hydrogenation increases the shelf life and flavor of foods containing these fats. Eating foods with trans fat increases your risk for heart disease.

Keep total fat intake between 25 percent to 35 percent of calories each day, and saturated fat intake at no more than 10 percent of calories each day. Consuming too much fat can lead to obesity, high cholesterol, and heart disease. The recommended amount of total fat for a fourteen to eighteen year-old girl is 65 to 92 grams (based on an average intake of 2,368 calories) and for a fourteen to eighteen year-old boy is 87 to 122 grams (based on an average intake of 3,152 calories).

Vitamins

These nutrients are important because they help your body use proteins, carbohydrates, and fats. Vitamins don't provide energy like the other nutrients, instead they help release energy stored in foods. Some examples of vitamins include: vitamin A, folic acid, thiamin, riboflavin, vitamin C, vitamin D, vitamin E, and vitamin K.

Minerals

These nutrients regulate chemical reactions in the body. There are two types of minerals: major minerals and trace minerals.

Major minerals are required in daily amounts greater than 100 milligrams. Some of the most important major minerals are: calcium, magnesium, phosphorus, potassium, sodium, and sulfur.

Trace minerals are minerals that your body requires in very small amounts. Two trace minerals that you have most likely heard about are iron and zinc.

One mineral that is often high in fast food is sodium. The *2005 Dietary Guidelines for Americans* recommends no more than 2,300 milligrams of sodium per day to maintain a healthy blood pressure.

Water

One other important nutrient is water. Your body is made up of more than 60 percent water. It is involved in all of your body processes and is part of your blood. Water carries other nutrients to your cells, helps your body remove waste, and regulates your body temperature. Your body loses water daily when you perspire, go to the bathroom, or just while breathing. In order to replace water losses, include water and good sources of fluids such as juice, milk, soup, fruits, and vegetables.

Fast-Food Investigation

Name:_____ **Date:**_____

Names of Student Scientist Team Members

Note: Every team member should have an assignment, and more than one student may be assigned to one role.

Material Coordinator:_____ Teamwork Facilitator:_____

Data Recorder:_____ Safety Coordinator:_____

Data Reporter:_____

1. **Name of fast-food restaurant:** _____

2. **Determine the least and most healthy foods sold at the restaurant.**

   Using the nutritional information from your fast-food restaurant, determine which is the least and most healthy food item sold at this restaurant and explain why.

   - Which is the least healthy food item sold at this restaurant? Record the total amount of calories, fat, carbohydrate, protein, and sodium in this food. Why is it the least healthy?

     Calories _____
     Fat _____
     Protein _____
     Carbohydrate _____
     Sodium _____

   - Which is the most healthy food item sold at this restaurant? Record the total amount of calories, fat, carbohydrate, protein, and sodium in this food. Why is it the healthiest?

     Calories _____
     Fat _____
     Protein _____
     Carbohydrate _____
     Sodium _____

3. **Plan three fast-food meals.**

   Using the nutritional information from your fast-food restaurant and the information from your "All About Six Major Nutrients Your Body Needs" student work sheet, put together three meals for the day (breakfast, lunch, and dinner). The meals should equal the recommended calorie daily intake, and include approximately the recommended amount of protein, fat, carbohydrate, and sodium for a girl or boy fourteen to eighteen years.

BREAKFAST

Food Item	Calories	Protein	Fat	Carbohydrate	Sodium
TOTAL					

LUNCH

Food Item	Calories	Protein	Fat	Carbohydrate	Sodium
TOTAL					

DINNER

Food Item	Calories	Protein	Fat	Carbohydrate	Sodium
TOTAL					

DAILY TOTALS

Calories _____

Fat _____

Protein _____

Carbohydrate _____

Sodium _____

4. Kicking the fast-food habit.

After the closing class discussion, describe one healthy change to make to your fast-food intake. What is one challenge or barrier to making this change? Based on your team's brainstorm, describe one strategy for overcoming this challenge and how to apply it to changing your fast-food habits. If you do not have a fast-food habit, think of a friend who does and how you could help them eat healthier.

One change to make to my (or my friend's) fast-food eating habits:

_____

Describe a barrier to making this change and strategies you will use to overcome the challenge:

_____

_____

_____

_____

_____

Class Fast-Food Summary

Create two charts (see below) and label one "Most Healthy" and one "Less Healthy." Record the student teams' findings.

"Most Healthy" Fast-Food Choices

Fast-Food Restaurant and Food Item	Calories	Protein (grams)	Fat (grams)	Carbohydrate (grams)	Sodium (milligrams)

"Less Healthy" Fast-Food Choices

Fast-Food Restaurant and Food Item	Calories	Protein (grams)	Fat (grams)	Carbohydrate (grams)	Sodium (milligrams)

Create a Campaign for Better Health

Overview

Students work individually to develop a campaign to alert fellow students about the amount of "hidden" calories, fat, and sodium in favorite fast foods. They include in their campaign visual illustrations that compare fast-food choices, tips for making healthy substitutions, and reasons to change or kick the fast-food habit.

Directions

Each student decides which fast-food restaurant choices they are going to "expose" and which healthier substitutions they will include in their comparison. They also include at least three tips for making healthier choices when eating fast food and reasons to change or kick the fast-food habit.

Materials

- Students use the "Create a Campaign" assessment sheet to illustrate and describe the elements of their campaign.
- Provide access to the Internet (with valid sources of nutrient information) or data on nutrient content of fast food.
- Display examples of campaign materials, for example:
  Champions for Change—http://cachampionsforchange.net
  Children's PowerPlay!—http://www.cdph.ca.gov/programs/cpns/Pages/ChildrensPowerPlayCampaign.aspx
  VERB—http://www.cdc.gov/YouthCampaign

Time

Provide time to complete the student assessment during class or as a homework assignment. After each student turns in their campaign descriptions, review it based on their use of accurate scientific terms, use of graphs to compare fast-food choices, understanding of the health benefits of reducing fast food, and their description of how the campaign will have a positive influence on food choice and health.

Create a Campaign

Name:_____ **Date:**_____

You are in charge of a campaign to alert fellow students about the amount of "hidden" calories, fat, and sodium in favorite fast foods. At the minimum, include in your campaign visual illustrations that compare healthy and less healthy fast-food choices, three tips for making healthy substitutions, and a convincing description of the reasons to change or kick the fast-food habit.

1. Decide which fast-food restaurant choices you will "expose," and which healthier substitutions you will recommend. List them here.

Restaurant Name	Less-Healthy Choice	Healthy Substitution

2. On the back of this sheet, create a bar graph that compares the amounts of calories, fat, and sodium in these foods. (Include accurate names for the compounds compared and units of measure.)

3. List three tips for making healthier choices when eating fast food.

_____

_____

_____

_____

_____

4. Write a brief, convincing paragraph about the reasons to change or to kick the fast-food habit. (Include benefits to health, finances, and other positive consequences.)

_____

_____

_____

_____

_____

5. Visit one or two of the sample Internet campaign sites. Describe two to three elements of your campaign and how they would have a positive influence on other students.

_____

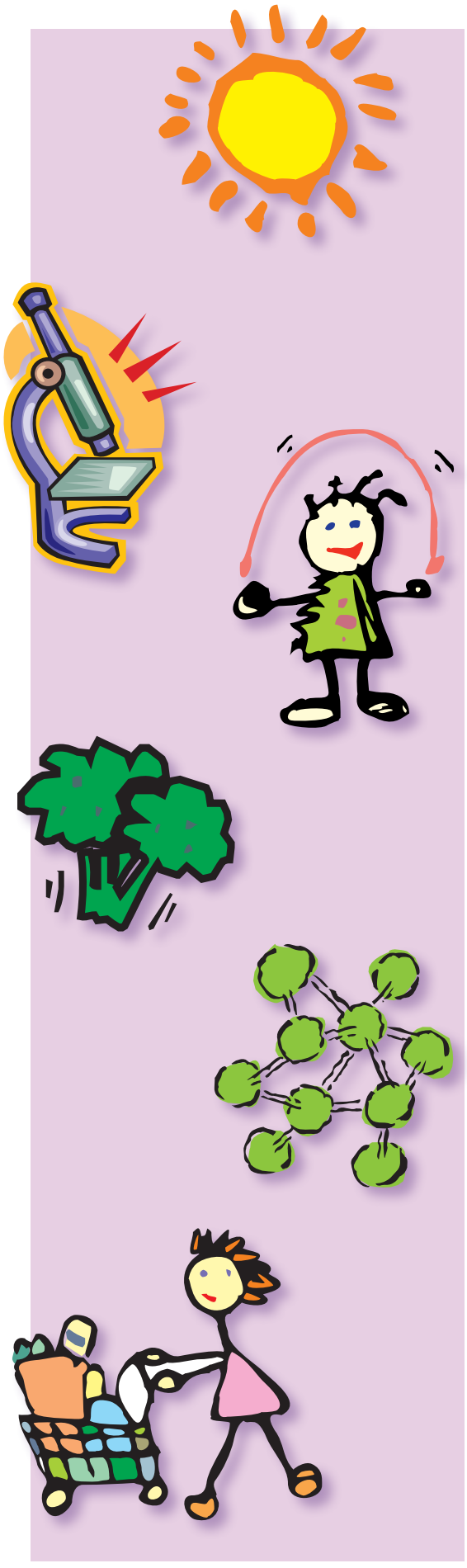
_____

_____

_____

_____

Resources



California Healthy Kids Resource Center Materials

Each Linking Lesson is built around a lesson(s) from reviewed, research-based resources available from the California Healthy Kids Resource Center (CHKRC). Other lessons in these curricula offer additional integration ideas and opportunities.

The table below and the descriptions that follow, provide an overview of CHKRC resources (with the CHKRC order number) to support or extend the grade-level Linking Lessons. Use the CHKRC registration and order form (in this section) to register and borrow materials. These curricula and other materials for science and nutrition integration can be borrowed for a free, four-week loan by ordering via toll-free phone (888) 318-8188, Internet (http://www.californiahealthykids.org), or fax (510) 670-4582.

Overview of CHKRC Resources Associated with the *Linking Lessons*

	Associated *Linking Lessons*											
CHKRC Resource Title (CHKRC Order #)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CANFit Super Manual (#5290)							■					
Decisions for Health—Grade 7 (#4314)									■			
Decisions for Health—Grade 8 (#4315)											■	■
Dynamotion—Food Fun (VHS) (#3246)								■				
Eat Well and Keep Moving (#6957)					■		■					
EatFit (#1506)										■	■	■
Fight Bac! (#1165)						■						
Fruits and Vegetables Power Play! (Grade 4–#1364, Grade 5–#1365)				■			■	■				
FUEL: Energy for Action (#2826)									■			
FUEL: The Perfect Machine (#2831)									■			
Harvest of the Month (#5798)	■	■	■	■		■	■	■		■		
Health and Fitness: Grade 2 (#7265)			■									
Health and Fitness: Grade 4 (#7267)				■								
Health and Fitness: Grade 5 (#7268)							■					
Health and Fitness: Kindergarten (#7263)	■	■										
Health and Wellness: Grade 2 (#7244)			■									
Health and Wellness: Grade 4 (#7248)				■								
Health and Wellness: Grade 5 (#7250)							■					
Health and Wellness: Grade 7 (#7254)									■			
Health and Wellness: Grade 8 (#7256)											■	■
Health and Wellness: Kindergarten (#7240)	■	■										
Healthy Foods from Healthy Soils (#7305)	■	■		■	■							
Kids Cook Farm-Fresh Food (#1439)	■	■		■								
Media Literacy for Health: A K-12 Activity Curriculum (#5352)			■									
Media-Smart Youth: Eat, Think, and Be Active! (#7393)									■			
MyPyramid for Kids Classroom Materials (#7599)					■							
Nutrition Pathfinders (#5020)				■								
Nutrition to Grow On (#2342)					■	■						
Planet Health (#1048)								■		■	■	■
Project Food, Land, and People (#5497–English, #5500–Spanish)			■									
Systems of the Body: Digestion (DVD) (#7750)								■				
Teen Health Course 2—Grade 7 (#7261)									■			
Teen Health Course 3—Grade 8 (#7262)											■	■

CANFit Super Manual (#5290) Audience: Grades five through nine

This manual offers 25 physical and nutrition activities, as well as background information focused on health issues of low-income, African American, Latino, Asian, and Native American students aged ten to fourteen years. It introduces heart disease, diabetes, fat, cholesterol, sodium, physical activity, body image, and the role of culture in risk, and appropriate instruction. Interactive lessons and games, as well as additional resources to promote physical activity, nutrition, snacks, and positive body image are included. A lesson matrix identifies California Department of Education English language arts, math, physical education, health, and science content standards aligned with each activity. The manual also supplies reproducible student activity sheets.

Decisions for Health—Grade 7 (#4314)

This seventh-grade curriculum is part of a sixth through eighth grade program that is state adopted for use in California schools. Concepts and skills are introduced and reinforced through hands-on and cross-curricular activities, guided and independent practice, and application in real-life contexts. Teaching transparencies, 15 resource packages that contain reproducible student work sheets aligned with chapter content, student book, student study guides, Spanish resources, guide reading, and student edition CD-ROMs are included. Assessment tools are provided for determining student prior knowledge and evaluating students' progress. A set of 15 videos to supplement the lessons is available separately (CHKRC #4320).

Decisions for Health—Grade 8 (#4315)

This curriculum is adopted for use in California schools. It addresses all content areas of comprehensive health. The course develops and reinforces students' life skills and understanding of age-appropriate health content through hands-on and cross-curricular activities, guided and independent practice, and application in real-life contexts. Assessment tools are provided for determining student prior knowledge and evaluating students' progress. Students engage in a variety of demonstrations, discussions, role-plays, skits, poster projects, and study activities to develop decision-making, refusal, media-analysis, and communication skills.

Dynamotion—Food Fun (VHS) (#3246) Audience: Kindergarten through grade five

Animated characters and students move, dance, and sing as they explore and learn about vitamins and minerals, healthy snacks, digestion, and fruits and vegetables. Young reporters on "Nutrition News," present interesting food facts, including how raisins are made. Viewers are encouraged to participate in the "Eating Mash," "Fabulous Food Parade," and other engaging activities. (27 minutes)

Eat Well and Keep Moving (#6957) Audience: Grades four through five

This collection of over 40 nutrition and physical activity lessons teaches students how to eat a balanced diet, plan meals, select healthy snacks, eat more fruits and vegetables, and increase endurance, strength, and flexibility. Many activities motivate students to perform physical activity while using art, math, social science, and science skills. A CD-ROM can be used to customize lessons and work sheets.

EatFit (#1506) Audience: Grades six through eight

This program contains nine lesson plans and a 20-page student workbook that can be used in conjunction with a Web site. Self-assessment and goal tracking are used to promote student behavior change. An online analysis program identifies areas of weakness in student eating records. Students then set fitness and eating goals for improvement during the remainder of the program. The analysis is also available in a paper version for students without computer access. Lessons include background for the teacher, lesson overview, timeline, objectives, links to California Department of Education content standards, lesson enhancements, recipes, questions, closing discussions, and take-home activities. Fitness, food labels, breakfast, media literacy, and fast food are some of the topics addressed in the lesson plans. In addition, a variety of investigative and experiential activities, role-plays, and games are provided for small group and independent practice to enhance student application of lessons to real-life situations.

Fight Bac! (#1165) Audience: Kindergarten through grade six

This set of lesson plans incorporates a presentation for kindergarten to grade three students, and lesson plans for students in grades four to six. The presentation includes scripts for a "read-aloud" story, songs, reproducible

masters, parent fact sheets, and a safe food game. The curriculum uses an inquiry approach to learning. A video introduces students to food safety as they follow school newspaper reporters investigating an outbreak of foodborne illness. Follow-up activities include hands-on experiments that teach the four steps to proper hand washing, reducing risk of cross contamination, and safe food handling practices. A Web site is available with additional activities, graphics, and resources.

Fruits and Vegetables Power Play! Audience: Grade 4–#1364, Grade 5–#1365

These school idea and resource kits encourage fourth and fifth grade students to eat more fruits and vegetables. Students taste-test different regional foods, use scientific inquiry and observation, conduct surveys, and prepare healthy snacks. Many activities connect the classroom to the cafeteria, home, and community. The activities are designed to increase students' awareness of the importance of fruits and vegetables in healthy eating and foster skills that enable them to make healthy choices. Student activity sheets, parent newsletters, and links to curriculum standards are included.

FUEL: Energy for Action (#2826) Audience: Grades five through twelve

A 24-minute video introduces this program that includes five lessons, guided discussions, classroom activities, and small-group projects to teach health skills. The unit examines the many obstacles to healthy eating, illustrating how students can influence their schools, communities, and peers to make healthy food choices the norm.

FUEL: The Perfect Machine (#2831) Audience: Grades five through twelve

A 24-minute video introduces this program that includes five lessons, guided discussions, classroom activities, and small-group projects to teach health skills. Exercise and physical activity are promoted in this unit, emphasizing that physical activity can take many forms. It can be done individually or in groups; with the goal being to have fun, create an active lifestyle, and stay healthy.

Harvest of the Month (#5798) Audience: Kindergarten through grade twelve

This kit provides the tools and resources to give students hands-on opportunities to explore, taste, and learn about the importance of eating fruits and vegetables. Materials are designed for low-income schools and communities and are provided for a variety of settings: the classroom, cafeteria, home, and community. Student knowledge of, access to, and preference for fruits and vegetables and regular physical activity are promoted. Materials are also available in English and Spanish online at http://www.harvestofthemonth.com.

Health and Fitness Series, Audience: Kindergarten through grade six

These grade-level resources are part of a kindergarten through grade six program that is state adopted for use in California schools. Grade-appropriate language and pictures, along with instructive examples and activities are provided throughout the materials. Health content is presented in written text, pictures, illustrations, charts, and presentation materials that encourage class discussion, facilitate small group activities, and introduce individual assignments. Each grade-level set includes a student text book, or a Big Book, and an Activity Book with student work sheets. The Teacher's Edition, and additional program components include summaries of diseases and disorders, take-home notes to family members in English and Spanish, assessment resources, and reproducible student work sheets.

Kindergarten (#7263)
Grade 2 (#7265)
Grade 4 (#7267)
Grade 5 (#7268)

Health and Wellness Series, Audience: Kindergarten through grade eight

These grade-level resources are part of a kindergarten through grade eight program that is state adopted for use in California schools. These materials cover all health content areas, including nutrition. Students are provided with varied opportunities to learn, practice, and apply basic life skills. Students conduct self-assessments, develop goal-setting, decision-making skills, and create health behavior contracts. At each grade level, health content is presented via written text, pictures, illustrations, charts, and color transparencies that become the source of class

discussion, small group, and individual learning activities. Big Books, student textbooks, as well as student glossaries in English and Spanish, before-, during- and after-reading activities, and ideas for supporting English language Learners develop literacy while teaching health concepts and skills.

Kindergarten (#7240)
Grade 2 (#7244)
Grade 4 (#7248)
Grade 5 (#7250)
Grade 7 (#7254)
Grade 8 (#7256)

Healthy Foods from Healthy Soils (#7305) Audience: Kindergarten through grade six

The food cycle is the focus of this 45-lesson resource. Lessons are organized into four themes: origins of food, choosing food, putting "garbage" to work, and simple gardening. Activities keep students engaged as they make models, taste new foods, keep journals, and chart the results of their investigations. Science skills are identified in each lesson and health skills are addressed, such as accessing information, practicing health-enhancing behaviors, goal setting, and analyzing influences on food choice. Student work sheets, parent letters, literature links, and additional resources accompany each lesson in the set.

Kids Cook Farm-Fresh Food (#1439) Audience: Kindergarten through grade seven

This 18-chapter curriculum contains activities, recipes, profiles of local farmers, and correlations to academic content standards for English-language arts, history and social science, mathematics, and science. It is designed to promote the use and enjoyment of fresh, seasonal, California-grown produce through classroom tasting and cooking. The chapters are equally divided among the three California growing seasons, late summer-fall, winter, and spring-early summer. Each chapter then focuses on one fruit or vegetable and includes two to three recipes, an activity, and a farm profile. Student learning is assessed using journals and with prompts throughout the lessons for students to keep record through diagrams, drawings, or writing. Tips to teachers for conducting food tastings, organizing field trips, cooking with kids, activity preparation, recipe demonstration, and cooperative learning are provided together with a glossary of agriculture and cooking terms, an equipment list, and additional references and resources.

Media Literacy for Health (#5352) Audience: Kindergarten through grade twelve

This interactive CD-ROM offers 48 media literacy lessons on nutrition, physical activity, alcohol and other drugs, tobacco, relationships and sexuality, and violence prevention. All of the lesson plans combine media literacy skill-building with health information, and feature lesson preparation, background information, Web links, commercials and video clips, sample advertisements, discussion guides, and extension activities. The lesson plans, work sheets, and handouts can be printed from the CD-ROM.

Media-Smart Youth: Eat, Think, and Be Active! (#7393) Audience: Grades six through eight

This interactive after school program is for young people in grades six through eight. It includes ten lessons that address media awareness, nutrition, physical activity, and media production. Youth learn to think critically about how media can affect their nutrition and physical activity choices, build skills to make good decisions about being physically active and eating nutritiously in daily life, and establish healthy habits that will last into adulthood. Each lesson incorporates a related video module, three activities, snack and action breaks, mini-production and take-home ideas, and student work sheets. The set includes a Facilitator's Guide, poster, DVD, and video with segments to supplement the lessons and provide a program overview for adult facilitators and youth participants.

Nutrition Pathfinders (#5020) Audience: Grades three through five

This program includes a CD-ROM, teacher's guide, student workbook, and links to a corresponding Web site. The CD-ROM simulates a visit to Camp Eatawella. During their three-day "stay," students work with their animated camp mates to win the final canoe race as they learn about using *MyPyramid* to choose meals and snacks. Students win the final canoe race by choosing foods that fill their food pyramid each day. Three levels of play are available to challenge students' as they apply their problem-solving, decision-making, and critical-thinking skills to real-

life situations. In addition to the games, the CD-ROM prompts students to keep journals and ask questions to gain knowledge about food and nutrition. The teacher's guide describes the student activities and links them to California content standards in reading-language arts, mathematics, science, social studies, and arts. Correlated classroom activities, extensive resources, Internet sites, and assessment rubrics are also provided for teachers. Cafeteria connections and home extensions are supplied together with student workbooks in Spanish and English.

Nutrition to Grow On (#2342) Audience: Grades four through six

This curriculum contains nine nutrition lessons. Each lesson is complemented with a gardening activity that uses students' observation, research, and critical-thinking skills. Students learn how to evaluate product information; read food labels; grow plants from seeds; and distinguish between stems, roots, leaves, and fruits. Each lesson is complete with student work sheets, answer sheets, and family newsletters. Applicable California language arts, math, and science content standards are identified in the appendix.

Planet Health (#1048) Audience: Grades five through eight

This interdisciplinary physical activity and nutrition curriculum includes 30 physical education micro-units and tools for assessing student activity. Additionally, 32 classroom lessons are integrated into four subject areas: math, science, language arts, and social studies. Lessons use investigations, cooperative learning, decision making and goal setting to build student skills to choose an active lifestyle and make healthful food choices. The classroom component also includes a campaign to reduce television viewing and activities to promote consumption of fruits and vegetables.

Project Food, Land, and People (#5497–English, #5500–Spanish) Audience: Preschool through grade twelve

This kindergarten to grade twelve curriculum was developed by a coalition of educators, agriculturalists, environmentalists, and resource conservationists to educate youth about the relationships between humans, the food chain, food production, and the environment. Each lesson is designed to promote critical-thinking and problem-solving skills, cooperative learning, and an appreciation for cultural differences. Appendices list lessons by title, grade level, skills, subjects, themes, and topics. Activities emphasize understanding of soils, plant growth, the importance of eating fruits and vegetables, and the diversity of agriculture in California. Student work sheets are provided.

Systems of the Body—Digestion (#7750) Audience: Grades five to twelve

This material contains a DVD and interactive activities, as well as a binder with student activities (including a pre/post test, research project, digestion quiz, and activities related to various parts of the digestive system). Student fact sheets about the digestive system, cell membranes, the small intestine, intestinal vili, and a glossary of terms are included. (16 minutes)

Teen Health Course 2—Grade 7 (#7261)

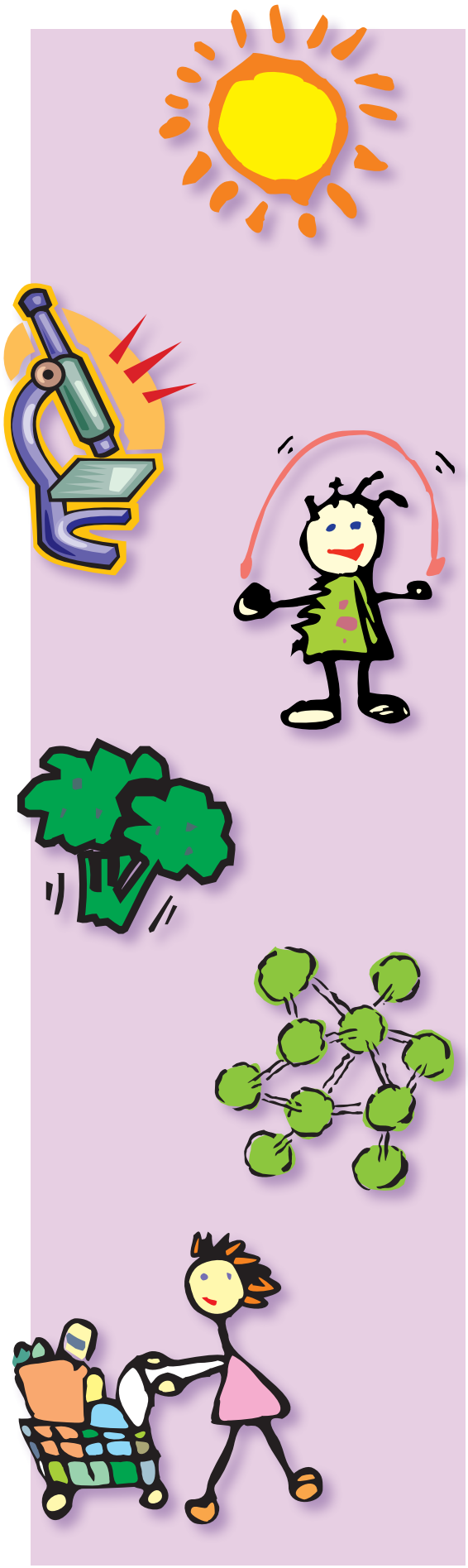
This seventh-grade curriculum is state adopted for use in California schools. The first chapters include a personal assessment of personal health practices and a class survey. Later chapters introduce the muscular, circulatory, and digestive systems and the role of well-planned meals, snacks, and physical activity in maintaining them. Lesson plans are interactive and present students with opportunities to develop critical-thinking, decision-making, media-literacy, goal-setting, and communication skills. Transparencies, inclusion strategies, parent letters, reproducible lesson plans, student quizzes, chapter tests, and performance assessment materials are supplied in the teacher resources and assessment sections. Complete Spanish translations of the student text, summaries, quizzes, activities, and parent letters are included.

Teen Health Course 3—Grade 8 (#7262)

This eighth-grade curriculum is part of a sixth-through eighth-grade program that is state adopted for use in California schools. The program begins by defining wellness, conducting a class wellness survey, and emphasizing taking responsibility for health. Decision-making, goal-setting, communication, and stress-management skills are developed along with health consumer skills. Chapters offer opportunities for students to plan meals and snacks, read food labels, set fitness goals, and build a positive body image.

Lesson plans are interactive, and present students with opportunities to develop critical-thinking, decision-making, media-literacy, goal-setting, and communication skills. In addition, lesson plans identify the California grade-level expectations aligned with each lesson, list key vocabulary, include online and hands-on activities. Student activity workbooks, transparencies, inclusion strategies, parent letters, reproducible lesson plans, student quizzes, chapter tests, and performance assessment materials are supplied in the teacher resources and assessment sections. Complete Spanish translations of the student text, summaries, quizzes, activities, and parent letters are included.

Glossary



Glossary

The vocabulary listed below are organized by grade level and Linking Lesson.

Kindergarten

***Linking Lesson* 1**

Sight	The sense that uses our eyes to see different things.
Smell	The sense that uses our nose to tell the difference between different things.
Taste	The sense that uses our tongue to tell the difference between different flavors.
Texture	The way things feel when we touch them.
Touch	The sense that uses our fingers to feel the difference between different things.

***Linking Lesson* 2**

Flower	The part of a plant that produces fruit or seeds for new plants.
Fruit	The part of a plant that protects the seed, like an apple.
Leaf	A growth from the stem that is flat and green and creates energy for the plant.
Root	The underground part of a plant.
Seed	The part of the plant that will grow into a new plant.
Stem	The main trunk of the plant, it provides support for the plant.

Grade 2

***Linking Lesson* 3**

Advertise	To attract attention to a product so people will buy it.
Attract	Foods and flowers get attention from people and insects by smells, colors, and taste.
Color	Bright colors are more easily seen than light colors; there are many different colors in nature.
Disperse	To spread to different areas.
Flower	The part of a plant that produces fruit or seeds for new plants.
Fruit	The part of a plant that protects the seed, like an apple.
Pattern	A design or decoration that sometimes repeats itself.
Pollinate	Bees and animals carry pollen grains, the male cells of plants, to the flowers of another plant so that the plants can form seeds.
Seed	The part of the plant that will grow into a new plant.
Sugar	It tastes sweet and can be found naturally or added to foods; it gives energy, however too much added sugar, can lead to tooth decay and other health problems.

Grade 4

***Linking Lesson* 4**

Calories	A unit to measure energy in foods.
Carbohydrate	Molecules in food that provide energy.
Energy	The power to move, grow, think and play; some foods contain more energy than others.
Grams	A unit of measure; one teaspoon of sugar is about four grams of carbohydrate.
Processed food	A food that has been changed from its original state by cooking, drying, or adding other ingredients.
Sodium	The element found in salt and many foods that is also needed in our body; but too much can be unhealthy.
Total fat	The combination of all of the types of fat contained in a food, including saturated, unsaturated, and polyunsaturated fats.
Whole food	A food that has not been changed in any way by adding other ingredients.

***Linking Lesson* 5**

Calcium	A mineral that makes bones and teeth strong and helps muscles work .
Carbohydrate	Molecules in food that provide energy and that are found in grains and other foods.
Carnivore	A living thing that eats meat.
Energy cycle	The movement of energy from the soil to plants to animals and back to the soil.
Fat	A source of energy in food that occurs as saturated fat, monounsaturated fats, polyunsaturated fats, and trans fats. Eating too much fat can increase the risk of heart disease and other health problems.
Herbivore	An animal that feeds mainly on plants.
Iron	A mineral that helps to carry oxygen to all parts of the body.
Minerals	Nutrients that regulate many processes in the body.
Nutrient	A substance that provides nourishment for growth or metabolism. Plants absorb nutrients mainly from the soil in the form of minerals and other compounds, and animals obtain nutrients from ingested foods.
Omnivore	An animal that feeds on both meat and plant substances.
Protein	A food nutrient that is used by the body to make muscles, hair, enzymes, and many important compounds and tissues.
Vitamin A	A vitamin that helps growth, sight, healthy skin, and prevents infection.
Vitamin C	A vitamin that keeps gums and skin healthy, prevents infections, and heals wounds.
Vitamins	Compounds that help the body use other nutrients.

***Linking Lesson* 6**

Bacteria	One-celled organisms found in the soil and in other places; they can be healthful or harmful.
Control	A standard of comparison in an experiment.
Decomposers	Organisms that break down plant or animal matter and return nutrients to the ecosystem (e.g., bacteria and fungi).
Experiment	A procedure or test to explore a question or to discover something unknown.
Food safety	Steps that help reduce the spread and growth of harmful bacteria and prevent foodborne illness.

Grade 5

Linking Lesson 7

Blood pressure	The pressure of blood against the walls of the blood vessels.
Cholesterol	A substance found in animal tissues; it performs many important functions, however too much can contribute to heart and blood pressure problems.
Compound	A substance made from two or more elements.
Diabetes	A disease from high glucose or sugar in the blood.
Insulin	A substance in the body that helps control blood sugar.
Mixture	A combination of two or more substances that are not chemically united.
Saturated fat	A type of fat that is "filled" with hydrogen atoms and it is usually solid at room temperature.
Simple carbohydrates	Simple sugars, including fructose (fruit sugar), sucrose (table sugar), and lactose (milk sugar), as well as several other sugars.
Sodium	An element that is necessary for the maintenance of normal fluid balance and other physiological functions.
Trans fat	A form of fat found mainly in processed foods and it can raise "bad" cholesterol levels.
Unsaturated fat	A fat from plant and animal sources that is liquid at room temperature.

Linking Lesson 8

Digestion	The process by which food is broken up physically (by the teeth), and chemically (by enzymes), and absorbed into the body.
Fiber	The part of plants and plant products that are wholly or partially indigestible (cellulose and pectin).
Intestine	The narrow, longer part of the intestine that digests and absorbs nutrients; it includes the duodenum, jejunum, and ileum.
Peristalsis	A contraction and relaxation of the digestive tract that moves food through the system.
Scientific model	A representation of a system used to investigate a question or hypothesis.
Variable	A factor or condition that may be held constant, changed, and measured, especially in a scientific experiment to test a hypothesis.

Grade 7

***Linking Lesson* 9**

Cancer	A disease caused by a growth or spread of abnormal cells.
Diabetes	A disorder of carbohydrate metabolism.
Gene	Found in the nucleus of the cell, the gene holds information to build or maintain cells and to pass on traits to offspring.
Heart disease	A disease of the heart or blood vessels.
High blood pressure	Elevated blood pressure. Blood pressure is the pressure exerted by blood on the walls of blood vessels.
Obesity and Overweight	Obesity and overweight are labels for weight ranges that are greater than considered healthy for a given height. The terms also identify weight ranges that increase the likelihood of certain diseases and other health problems.
Prevention	An act or campaign that stops something from happening (e.g., they campaigned to prevent heart disease).
Risk factor	A practice that increases the likelihood of a disease or illness.

***Linking Lesson* 10**

Achene	A fruit with a hard exterior and that splits to reveal a single seed inside (e.g., sunflower seeds).
Aggregate fruit	A simple fleshy fruit that develops from a single flower with many pistils; each pistil develops into a tiny fruitlet (e.g., strawberries and blackberries).
Berry	A small, juicy fruit that contains many seeds, instead of one hard woody seed (e.g., tomatoes and grapes).
Dispersal	The process of distributing or spreading to other areas.
Drupe	A fruit with an outer skin, a usually juicy middle layer, and a hard inner shell that includes A single seed (e.g., peaches, cherries, and plums).
Dry fruit	A fruit that is dry and hard when ripe (e.g., peanuts and peas).
Hesperidium	A fruit from a citrus plant (e.g., oranges and lemons).
Pepo	A fruit with many seeds, a fleshy interior, and a firm rind (e.g., melons and cucumbers).
Pome	A fruit with edible flesh and several seed chambers (e.g., apples, pears, and quince).
Seed	The part of the plant that produces a new plant.

Grade 8

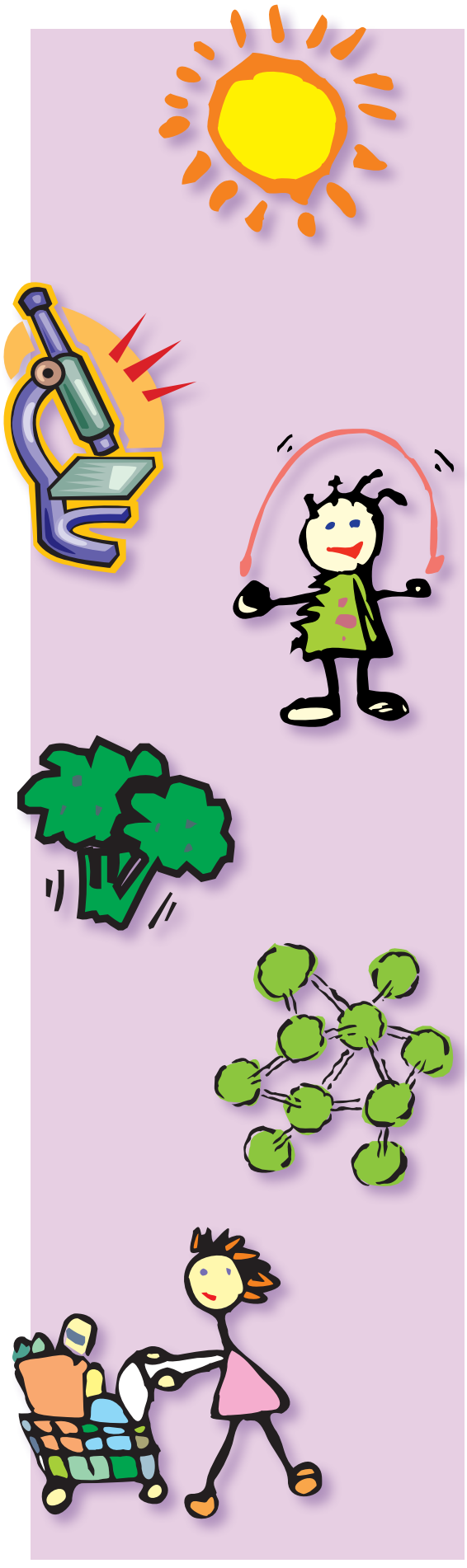
***Linking Lesson* 11**

Acid	A substance having a pH value of less than seven.
Antioxidant	Any substance that inhibits oxidation (e.g., vitamin E or beta carotene are capable of counteracting the effects of oxidation in tissues).
Base	A substance having a pH of more than seven.
Chemical reaction	A process in which one or more substances are changed into others.
Control	A group or substance that is not exposed to a chemical or treatment being investigated so that it can be compared with groups that are exposed to the treatment.
DNA	Deoxyribonucleic acid (DNA) is a macromolecule that is the main component of chromosomes in cells and is the material that transfers genetic characteristics.
Hypothesis	A proposed explanation for an observation or problem that is investigated (working hypothesis) or accepted based on results or facts.
Oxidation	A chemical reaction in which a material gives up electrons (e.g., when the material combines with oxygen).
pH	The symbol used to express the acidity or alkalinity of a solution on a scale of zero to fourteen.
Product	A substance obtained from another substance through chemical change.
Reactant	Any substance that undergoes a chemical change in a reaction.
Variables	Factors that may or may not change during an experiment; a variable feature or factor.

***Linking Lesson* 12**

Calorie	A unit for measuring energy in food.
Carbohydrate	Molecules in food that provide energy and that are found in grains and other foods.
Complex carbohydrate	This form of carbohydrate provides long-lasting energy and includes starches and fiber.
Fat	A nutrient that provides lasting energy, helps the body store vitamins, and protects vital organs. In high levels, fat can be harmful.
Mineral	This type of nutrient helps regulate chemical reactions in the body.
Nutrient	A substance or ingredient that can be used for energy, growth, or building tissue.
Protein	A nutrient that is used to create muscles, skin, nails, and hair.
Saturated fat	A type of fat that is solid at room temperature and that is found in dairy products, meats and poultry, and solid vegetable oils.
Simple carbohydrate	A form of carbohydrate such as sugar that provides quick energy.
Trans fat	A fat that is created during the process of adding hydrogen to vegetable oil.
Unsaturated fat	A type of fat that is usually liquid at room temperature.
Vitamin	A nutrient that helps the body use proteins, carbohydrates, and fats.

Nutrition Facts



Nutrition Facts

Many of the Linking Lessons address the importance of eating a variety of foods and nutrients, and their relationship to good health. This section provides a summary of the recommended amounts from each *MyPyramid* food group, as well as recommended intakes for specific nutrients. Many students don't consume adequate amounts of many food groups and nutrients. Students can use the data in these tables to compare their intakes with recommended values.

The *MyPyramid* food group recommendations are summarized below and are based on age and gender.

Food Groups	**Student Groups by Age and Gender** (Ranges are for Sedentary to Active children.)					
	Ages 4 – 8 years		Ages 9 – 13 years		Ages 14 – 18 years	
	Females	Males	Females	Males	Females	Males
Fruit	1-1½ cups	1½-2 cups	1½-2 cups	1½-2 cups	1½-2 cups	2-2½ cups
Vegetable	1½-2½ cups	1½-2½ cups	2-3 cups	2½-3½ cups	2½-3 cups	3-4 cups
Grains	4-6 oz-eq	5-6 oz-eq	5-7 oz-eq	6-9 oz-eq	6-8 oz-eq	7-10 oz-eq
Meat and Beans	3-5 oz-eq	4-5½ oz-eq	5-6 oz-eq	5-6½ oz-eq	5-6½ oz-eq	6-7 oz-eq
Milk	2-3 cups	2-3 cups	3 cups	3 cups	3 cups	3 cups
Oils	4-5 tsp	4-6 tsp	5-6 tsp	5-8 tsp	5-7 tsp	6-11 tsp

Sedentary means a lifestyle that includes only the light physical activity associated with typical day-to-day life.

Active means a lifestyle that includes physical activity equivalent to walking more than 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life.

Fruit Group includes all fresh, frozen, canned, and dried fruits and fruit juices. In general, 1 cup of fruit or 100% fruit juice, or 1/2 cup of dried fruit can be considered as 1 cup from the fruit group.

Vegetable Group includes all fresh, frozen, canned, and dried vegetables and vegetable juices. In general, 1 cup of raw or cooked vegetables or vegetable juice, or 2 cups of raw leafy greens can be considered as 1 cup from the vegetable group.

Grains Group includes all foods made from wheat, rice, oats, cornmeal, barley, such as bread, pasta, oatmeal, breakfast cereals, tortillas, and grits. In general, 1 slice of bread, 1 cup of ready-to-eat cereal, or 1/2 cup of cooked rice, pasta, or cooked cereal can be considered as 1 ounce equivalent from the grains group. At least half of all grains consumed should be whole grains.

Meat & Beans Group in general, 1 ounce of lean meat, poultry, or fish, 1 egg, 1 Tbsp. peanut butter, 1/4 cup cooked dry beans, or 1/2 ounce of nuts or seeds can be considered as 1 ounce equivalent from the meat and beans group.

Milk Group includes all fluid milk products and foods made from milk that retain their calcium content, such as yogurt and cheese. Foods made from milk that have little to no calcium, such as cream cheese, cream, and butter, are not part of the group. Most milk group choices should be fat-free or low-fat. In general, 1 cup of milk or yogurt, 1 1/2 ounces of natural cheese, or 2 ounces of processed cheese can be considered as 1 cup from the milk group.

Oils include fats from many different plants and from fish that are liquid at room temperature, such as canola, corn, olive, soybean, and sunflower oil. Some foods are naturally high in oils, like nuts, olives, some fish, and avocados. Foods that are mainly oil include mayonnaise, certain salad dressings, and soft margarine.

Discretionary Calorie Allowance is the remaining amount of calories in a food intake pattern after accounting for the calories needed for all food groups—using forms of foods that are fat-free or low-fat and with no added sugars. The calories are not included in this table.

Source: United States Department of Agriculture. 2005. *MyPyramid Food Intake Patterns*. http://www.mypyramid.gov/professionals/pdf_food_intake.html (accessed March 3, 2009).

Nutrition Facts

In addition to food group recommendations, there are recommended intakes for specific nutrients. The table below includes the recommended intakes of specific nutrients as a combination of Recommended Dietary Allowances (RDA) and Adequate Intakes (AI). Both recommendations are used to set goals for individual intake and are set by the Food and Nutrition Board of the Institute of Medicine of the National Academies.

The RDAs are in bold type and the AI's are in ordinary type. RDA's are set to meet the needs of almost all (97%-98%) individuals in a group. The AI is believed to cover needs of all adolescents in the group; however more confidence in the data is needed to specify the percentage of individuals covered by this intake.

Nutrient	**Females**		**Males**	
	9 – 13 years	**14 – 18 years**	**9 – 13 years**	**14 – 18 years**
Macronutrients				
Energy (kcals/day)	2,071	2,368	2,279	3,152
Carbohydrate (g/day)	**130**	**130**	**130**	**130**
Total Fiber (g/day)	26	28	31	38
Protein (g/day)	**34**	**46**	**34**	**52**
Total Fat (25 top 35 percent of kcals/day) (g/day)	57 - 80	65 - 92	63 - 88	87 - 122
Vitamins				
Vitamin A (μg/day)	**600**	**700**	**600**	**900**
Vitamin C (mg/day)	**45**	**65**	**45**	**75**
Vitamin D (μg/day)	5	5	5	5
Vitamin E (mg/day)	**11**	**15**	**11**	**15**
Vitamin K (μg/day)	**60**	**75**	**60**	**75**
Thiamin (mg/day)	**0.9**	**1.0**	**0.9**	**1.2**
Riboflavin (mg/day)	**0.9**	**1**	**0.9**	**1.3**
Niacin (mg/day)	**12**	**14**	**12**	**16**
Vitamin B6 (mg/day)	**1**	**1.2**	**1**	**1.3**
Folate (μg/day)	**300**	**400**	**300**	**400**
Vitamin B12(μg/day)	**1.8**	**2.4**	**1.8**	**2.4**
Minerals				
Calcium (mg/day)	1,300	1,300	1,300	1,300
Iron (mg/day)	**8**	**15**	**8**	**11**
Magnesium (mg/day)	**240**	**360**	**240**	**410**
Potassium (g/day)	4.5	4.7	4.5	4.7
Phosphorus (mg/day)	**1,250**	**1,250**	**1,250**	**1,250**
Selenium (μg/day)	**40**	**55**	**40**	**55**
Zinc (mg/day)	**8**	**9**	**8**	**11**

Source: Food and Nutrition Board, Institutes of Medicine, National Academies. 2004. *The Dietary Reference Intakes: Recommended Intakes for Individuals*. http://fnic.nal.usda.gov (accessed March 3, 2009).

Nutrition Facts

This table briefly summarizes the food sources and function of common nutrients, including carbohydrates, protein, fats, vitamins, and minerals. The scientific name of a vitamin or mineral is in parentheses.

MACRONUTRIENTS			
Nutrient	Food Sources	What does it do?	Deficiency Symptoms
Carbohydrate	Simple sugars are found in fruits and honey, table sugar, molasses, maple syrup, soda, milk, and many other sweet foods. Complex carbohydrates are in cereals and grains (bread, rice, pasta, oats), and some root vegetables, such as potatoes and parsnips.	Carbohydrates are our main source of energy. They include simple sugars and complex carbohydrates.	There is no absolute requirement for dietary carbohydrate. The brain, the red blood cells, and other organs use glucose as a preferred source of energy.
Fat	Mono-unsaturated fats include olive oil, peanut oil, and poly-unsaturated fats include sunflower or safflower oil. Saturated fats are found in meat, butter, cheese, as well as palm oil and coconut oil. Trans fats may be found in shortening, some margarine, and commercial baked goods and fried foods, such as crackers, cookies and cakes, doughnuts and French fries.	Fats may be saturated, unsaturated (mono-unsaturated or poly-unsaturated), or trans fats. Fats are used for energy storage and insulation, and they are key building blocks of cell membranes. Dietary fat also helps absorb fat-soluble vitamins.	A high intake of saturated fat and trans fat can increase risk of heart disease.
Protein	Meat, dairy products, nuts, seeds, beans, lentils, peanuts, eggs	Proteins are actually chains of small molecules called amino acids. Protein is in every living cell in the body. It is important in maintaining bones, muscles, hair, and skin. Protein is needed every day, because the body doesn't store protein the way it stores fats or carbohydrates.	Most Americans get enough protein. Protein is a common component of most foods.
Fiber	Whole grains, beans, nuts, fruits, and vegetables	Fiber is the part of the plant that can't be digested. It adds bulk to the diet, and helps digestion and weight maintenance, and helps prevent constipation.	Add fiber to the diet slowly. Increasing dietary fiber too quickly can lead to gas, bloating, and cramps.
Phytochemicals	Broccoli, cauliflower and brussel sprouts, apples, grapefruit, red wine, soy, and tomatoes	Plants are sources of phytochemicals which may protect against cancer. Isothiocyanates (found in broccoli, cauliflower and brussel sprouts) may suppress tumor growth and hormone production. Flavonoids (apples, grapefruit, red wine, etc.), soy and lycopene (found in tomatoes) also demonstrate protection against cancer.	Studies indicate that a diet high in phytochemicals and fiber may reduce the risk of developing cancers of the stomach, colon rectum, esophagus, larynx, and lung.

VITAMINS

There are two classifications of vitamins, 1) Water soluble vitamins dissolve in water and are easily excreted in the urine, and 2) Fat soluble vitamins are not easily excreted, and may be stored in the body for long periods of time.

Vitamin	Food Sources	What does it do?	Deficiency Symptoms
A (Retinol) *Fat soluble*	Yellow, orange, and green fruits and vegetables, milk, egg yolk	Helps the eyes see in low light; helps cells grow.	Night blindness; dry skin
B1 (Thiamine) *Water soluble*	Whole and enriched grains, pork, legumes	Helps the body make energy.	Beriberi, weakness, fatigue, nerve damage
B2 (Riboflavin) *Water soluble*	Milk, eggs, whole and enriched grains, cereal	Helps the body make energy.	Glossitis (inflammation or swelling of the tongue)
B3 (Niacin) *Water soluble*	Whole and enriched grains, peanuts, meats	Helps the body make energy and red blood cells.	General weakness, skin inflammation, pellagra
B6 (Pyridoxine) *Water soluble*	Meat, poultry, fish, wheat, corn	Helps the body make hemoglobin and proteins. It also helps immune and nerve functions.	Anemia (low energy), skin inflammation, depression, confusion
B12 (Cobalamin) *Water soluble*	Animal foods only: meat, milk, etc.	Helps the body make red blood cells and DNA; it also helps nerve function.	Anemia (low energy), numbness, poor memory, or sore tongue
Folate (Folic acid or Folacin) *Water soluble*	Dark green vegetables, oranges, whole and enriched grains	Helps make red blood cells, DNA, and proteins.	Anemia, birth defects (when the mom-to-be is deficient), poor growth, swollen tongue
C (Ascorbic Acid) *Water soluble*	Citrus fruits, tomatoes, strawberries, kiwi, green peppers	Keeps gums healthy, heals wounds, and is needed for growth and repair of tissues.	Bleeding gums, rough skin, easy bruising
D (Cholecalciferol) *Fat soluble*	Milk, egg yolk, exposure to sunlight	Helps absorb calcium, form bones, and reduce inflammation.	Weak bones in children (rickets) and adults (osteomalacia)
E (Tocopherol) *Fat soluble*	Vegetable oil, nuts, wheat germ	An antioxidant that helps keep cells healthy.	Anemia (low energy)
K (Phylloquinone) *Fat soluble*	Green leafy vegetables, egg yolk, intestinal bacteria	Helps blood to clot.	Easy bruising and bleeding

MINERALS Major minerals are required in greater amounts than trace minerals. Electrolytes help balance water in the body.			
Mineral	**Food Sources**	**What does it do?**	**Deficiency Symptoms**
Calcium *Major mineral*	Milk, yogurt, green leafy vegetables, soft bones (sardines)	Component of teeth and bones; nerve transmission; muscle contraction.	Weak bones in adults (osteoporosis), muscle cramps, abnormal heart beat
Iron *Major mineral*	Meats, eggs, enriched breads and cereals	Helps make hemoglobin and carry oxygen to cells.	Anemia (low energy), low body temperature, decreased immune function
Magnesium *Trace mineral*	Seafood, grains, legumes, nuts, green vegetables	Works with calcium and phosphorus to make bones; helps the body make energy.	Irregular heart beat, muscle weakness
Potassium *Major mineral* *Electrolyte*	Oranges, tomatoes, potatoes, meat, milk	Helps to balance body water, to make proteins, and to build muscle.	Abnormal heart beat, muscle weakness, low energy
Selenium *Trace mineral*	Seafood, dairy, legume, grains	Helps the body make enzymes, and forms antioxidant proteins that protect cells.	Weak immune system, low thyroid function
Sodium *Major mineral* *Electrolyte*	Table salt, processed foods, milk, cheese, meat, eggs	Helps the body balance water content and helps nerve impulses and muscle contractions.	Too much may raise blood pressure and low amounts may cause fatigue or confusion.
Zinc *Trace mineral*	Seafood, liver, meat, eggs	Helps the body make enzymes, proteins, and DNA, and is needed for taste and smell.	Poor growth, poor wound healing, taste and smell impairment

Sources:

American Society for Nutrition. 2009. *Nutrient Information*. http://jn.nutrition.org/nutinfo (accessed August 3, 2009).

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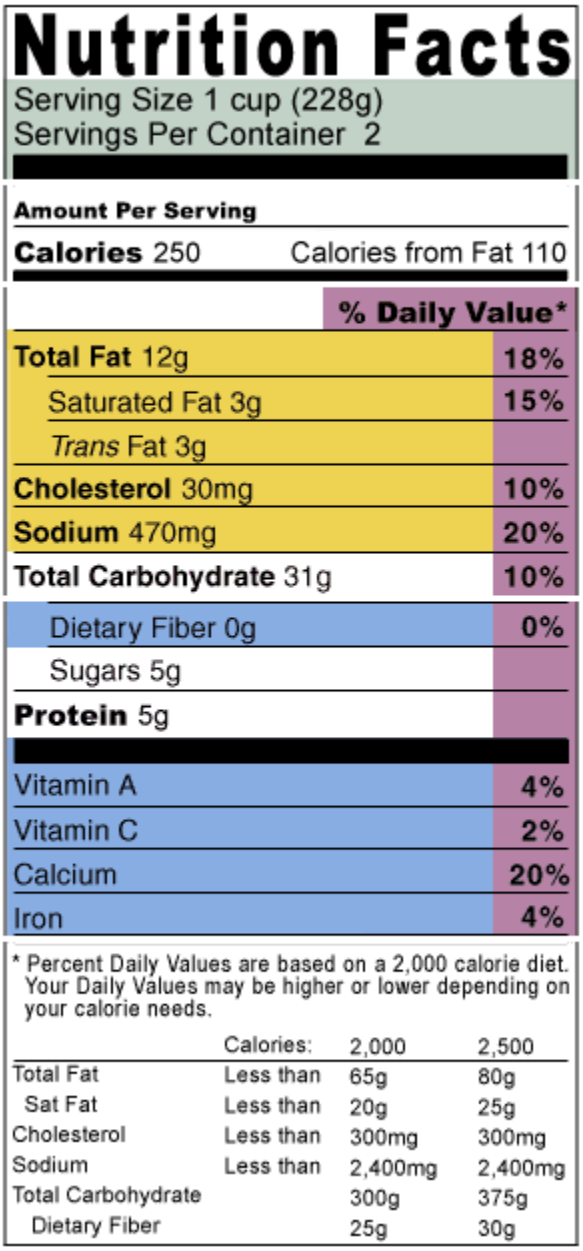
Nutrition Facts Label

Overhead

Sample label for
Macaroni & Cheese



Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container 2

Amount Per Serving

Calories 250 Calories from Fat 110

	% Daily Value*
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Protein 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%

* 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
Dietary Fiber		25g	30g

Source: United States Food and Drug Administration. 2009. *How to Understand and Use the Nutrition Facts Label*. http://www.fda.gov/Food/LabelingNutrition/ConsumerInformation (accessed March 6, 2009).

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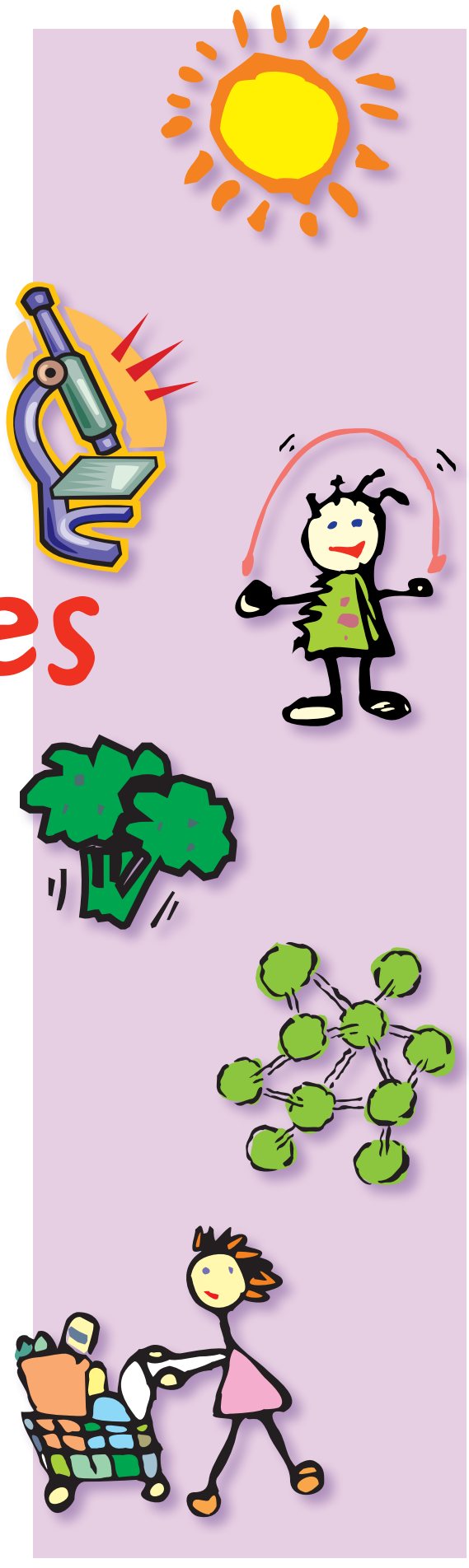

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