**The relationship between agriculture and lifestyle**

**Pillar 4 C. Describe the value that can be added by processing foods**

 (9th – 12th Grade)

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| **Website:** <http://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=402&author_state=0&grade=6>  |

**The Quicker the Better? Food Processing**

**Purpose**

Students will explore different levels of food processing and the ways in which processed foods affect the health of our diets by looking at examples of foods from the grocery store and by closely examining food labels.

**Materials**

**Motivator**

* *Cow to Milk Images*

**Activity 1**

* *The Quicker the Better? Food Processing* PowerPoint
* *Levels of Food Processing* handout
* *From Farm to Table* activity sheet, 1 per student
* One grocery bag containing 3–5 examples of processed foods that come from the same raw product. For example:
	+ Oats - regular rolled oats, instant oatmeal, oatmeal cookies
	+ Wheat - whole wheat flour, white flour, pasta, pancake mix, bread, frozen waffles
	+ Corn - frozen corn, canned corn, corn flour, corn tortillas, corn flakes cereal, sweets containing high fructose corn syrup
	+ Apples - fresh apples, apple juice, applesauce, dehydrated apples, apple desserts
	+ Chicken - frozen/fresh chicken, chicken broth/stock, chicken nuggets, canned chicken noodle soup, frozen chicken-based dinner
* Food labels (including name of food, nutrition facts, and ingredients list), 2–3 per pair of students

**Activity 2**

* Food labels (can use the same labels as above)
* Internet access for student research
* Calculators and scratch paper for each student

**Activity 3**

* *An Inconvenient Truth* activity sheet

**Essential Files (maps, charts, pictures, or documents)**

* [The Quicker the Better Food Processing PowerPoint](http://naitc-api.usu.edu/media/uploads/2016/01/19/The_Quicker_the_Better_Food_Processing_1_1.pptx)
* [Cow to Milk Image](http://naitc-api.usu.edu/media/uploads/2016/01/18/Cow_to_Milk_Images.pdf)
* [An Inconvenient Truth Activity Sheet](http://naitc-api.usu.edu/media/uploads/2016/01/14/InconvenientTruth_activitysheet_1.pdf)
* [From Farm to Table Activity Sheet](http://naitc-api.usu.edu/media/uploads/2016/01/14/FromFarmtoTable_activitysheet_1.pdf)
* [Levels of Food Processing Handout](http://naitc-api.usu.edu/media/uploads/2016/01/14/LevelsFoodProcessing_handout.pdf)

**Vocabulary**

**Food processing:** the process of transforming raw agricultural products, like grains, vegetables, meat, or milk, into end products to be sold to consumers

**Did you know? (Ag Facts)**

* Fortification is a type of food processing. In the United States some commonly fortified foods are salt (with iodine), milk (with vitamin D), and grain products (with thiamin, niacin, riboflavin, iron, and folic acid).1
* Between 1966 and 1999 the amount of time that US adults spent cooking meals decreased by 25%.1
* The Native Americans of the Great Plains made a convenience food called pemmican that consisted of strips of dried buffalo meat mixed with fat and berries.1

**Background Agricultural Connections**

**Food processing** is the action of transforming raw agricultural products, like grains, vegetables, meat, or milk, into end products ready to be sold. Most foods that we consume require some processing. Everything from chopping to mixing ingredients to cooking can be considered a part of food processing. A processed food has been changed physically or chemically after being harvested. The amount of processing varies from food to food, ranging from minimal to high.

**Interest Approach – Engagement**

1. Ask students if they think milk is a processed food. If needed, give students the definition of food processing. Display the first *Cow to Milk* image. Ask students, "Does milk go straight from the dairy farm to a grocery store?"
2. Ask students to use their prior knowledge to help you make a chronological list of what happens to milk from the time it leaves the dairy farm where it was produced until it arrives at the grocery store to be purchased. Use the second *Cow to Milk* image to help illustrate.
	* At the dairy farm, the milk was cooled and stored in a tank until it was transported to a milk processing plant.
	* At the milk processing plant it was pasteurized, separated into cream and milk, recombined into milk with 2% fat, and homogenized to prevent the cream from separating. The vitamins A and D were added to the milk. Finally, the milk was packaged in cartons or jugs.
	* Last, the milk is transported again in a refrigerated truck to the grocery store. This entire process only takes a few days.
3. Ask students again if they think milk is a processed food. What about cheese, butter, or ice cream? Inform your students that they will be learning about food processing.

**Procedures**

**Activity 1: What is food processing?**

1. Display the PowerPoint *The Quicker the Better? Food Processing.*Use slide two of the PowerPoint to help students understand that food processing is anything that takes place between the farm where food is produced and the consumer.
2. Discuss with your students the many ways foods are processed. Some examples of processing may include: crushing, grinding, pressing, flaking, chopping, peeling, pitting, dehydrating, canning, freezing, pickling, smoking, salting, bottling, or bagging. Use slides three to seven of the PowerPoint to show examples of raw food products and the final products they may be turned into.
3. Next, explain that there are many levels of food processing. Use the information provided in the *Background* section as well as slide eight from the PowerPoint. Use slides nine and ten of the PowerPoint to illustrate how one raw product can be processed to various levels.
4. Display the *Levels of Food Processing* handout for students to reference, and provide each student with a copy of the *From Farm to Table* activity sheet to track information about the foods you are about to discuss.
5. Hold up the grocery bag containing 3–5 different foods that have all been derived from the same raw or primary product (for example: canned tomatoes, salsa, ketchup, and spaghetti sauce, all of which come from tomatoes; the *Materials List* provides additional ideas).
6. Tell the students that now it is their turn to examine some foods from the grocery store and decide how processed each food is. Take one food out of the bag at a time. Show the students each food, and read the ingredients list out loud. For each one, students should write the name of the food, the number of ingredients, the type of packaging, and the temperature at which it is stored on their activity sheets. Then, discuss whether they think the food is highly, moderately, or minimally processed.
7. Discuss the reasons why foods are processed. Some examples include: to increase shelf life, to improve flavor and texture, to provide convenience, and to make foods easier to transport.
8. Ask the students to define the word *convenience*. Many highly processed foods are referred to as *convenience foods*. Discuss the following questions:
	* Why would a consumer choose to eat a convenience food? (*to save time, because they don’t know how to cook, or students may say that they aren’t allowed to cook on the stove without a parent present*)
	* Can minimally processed foods be convenient? (*yes, think of pre-washed and cut vegetables and fruits or individually-sized cartons of milk*)
9. Divide students into pairs, and give each pair of students 2–3­ food labels (each label should include the name of the food, nutrition facts, and ingredients list).
10. Ask students to examine the ingredients lists. Explain to the class that the primary or main ingredient is the first one listed and that the ingredients are listed in descending order according to how much of the ingredient is included in the food.
11. Ask students to write the name of the food and the primary ingredient from each food label on their *From Farm to Table* activity sheets. Then, ask them to finish filling in the columns on the activity sheet for each food label.
12. Complete this activity with a formative assessment. Explain to the students that you will be showing them a series of pictures of common foods. Using what they have learned, they should determine if the food is minimally, moderately, or highly processed. Instruct students to give a thumbs-up to represent high processing, thumbs-down to represent minimal processing, and thumb-in-the-middle to represent moderate processing. Use slides 11–27 of the PowerPoint.

**Activity 2: Nutritional Value**

1. Using their food labels from the previous activity, have each student identify one ingredient with which they are unfamiliar (i.e., sodium bicarbonate, citric acid, monosodium glutamate, sorbitol).
2. Have the students research these items using the Internet to discover the additives’ purpose in food processing.
3. Ask the students to identify whether or not their ingredient contributes to the nutritional value of the food. Explain to the students that raw products often have greater nutritional value than processed food products because processing can remove and destroy nutrients. Processors often have to add vitamins and minerals back into the processed product so that it has some nutritional value.
4. Have the students identify the salt and sugar content from their food labels. Ask them to convert the milligrams/grams to teaspoons using the following conversion formulas.
	* The sugar will be listed in grams; to convert grams to teaspoons, divide the number of grams by four. (i.e., 22 grams of sugar divided by 4 equals 5.5 teaspoons of sugar.)
	* The salt will be listed in milligrams; to convert milligrams to teaspoons multiply the number of milligrams by 0.00012 (i.e., 980 mg of sodium multiplied by 0.00012 equals 0.12 teaspoons of salt.) Students may need to think about how this number can convert to a percentage or a fraction to understand the relative quantity (0.12 teaspoons = 12% of one teaspoon = 1/8th of a teaspoon).
5. Tell students that it is recommended that we eat no more than 45 grams of sugar (12 teaspoons) and no more than 2400 milligrams (about 1 teaspoon) of salt daily. Are there foods high in sugar or salt? Do they also provide healthy vitamins and minerals?
6. Use the following questions to help students think about healthy diet choices:
	* How does consuming too much salt affect our bodies? *(can lead to high blood pressure)*
	* How does too much sugar affect our bodies? *(can lead to weight gain and increase susceptibility to diabetes)*
	* What role do convenience foods play in a healthy or unhealthy diet? *(many convenience foods are high in sugar, salt, and/or fat, which can lead to obesity and/or high blood pressure; conveniently pre-washed and cut fruits and vegetables can promote healthy snacking)*

**Activity 3: Activity Sheet Review**

1. Give each student a copy of the activity sheet *An Inconvenient Truth*.
2. Have them complete the activity sheet according to the directions.

**Concept Elaboration and Evaluation**

After conducting these activities, review and summarize the following key concepts:

* Most foods that we consume require some processing, and there are both advantages and disadvantages to this processing.
* Reading food labels can help determine how processed a food is and how healthy a food is.
* Many highly processed foods contain lots of sugar and salt, and consuming too much sugar or salt can negatively impact our health.

**Enriching Activities**

* Ask the students to find the serving size on their food labels. Have them write the total number of servings from the entire product on a piece of paper. Ask them to calculate the amount of salt and sugar in the entire product (multiply the number of servings by the amount of grams/milligrams from the serving size). Have them convert this number from the entire product into teaspoons. Ask the students if they generally eat more or less than the actual serving size. Do they feel that the serving sizes really reflect what people eat?
* Have the students use teaspoons to measure out the actual sugar and salt content of processed foods.
* Bring in two cans of peas, one that is low sodium and one regular. Examine and discuss the salt content of each. Have the students taste the vegetables and discuss why salt would be added during the processing of canned peas. Students will notice that the low-sodium canned peas have little flavor. (This is due to the heat used during the canning process, which preserves the product and some of the nutritional value, but the flavor is compromised. Salt is added to enhance the flavor and retard spoilage.)

**Suggested Companion Resources**

* [Higher or Lower: Ingredient Investigation](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=371) (Activity)
* [Glorious Grasses: The Grains](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=479) (Book)
* [Pizza Time Bulletin Board](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=386) (Poster, Map, Infographic)
* [Who Makes the Best Burger?](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=722) (Poster, Map, Infographic)
* [Can Science Create a 'Greener' Pickle? video](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=491) (Multimedia)
* [Modern Marvels: Supermarkets](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=525) (Multimedia)
* [Nutrition Research Articles](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=519) (Booklets & Readers)
* [10 Tips Nutrition Education Series](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=517) (Website)
* [Antimicrobial Wash for Fresh Produce](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=546) (Website)
* [Food Dialogues](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=523) (Website)
* [Food-A-Pedia](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=429) (Website)
* [Nutrition Facts Label Programs and Materials](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=729) (Website)
* [What's In My Food?](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=652) (Website)

**Sources/Credits**

1. <http://www.jhsph.edu/research/centers-and-institutes/teaching-the-food-system/curriculum/_pdf/Food_Processing-Background.pdf>