



I'M EATING WHAT?!?

Written by Amy Rowley and Jeremy Peacock

Annotation:

Students will be introduced to one another, as well as to the field of food science, as they match raw ingredients with finished food products.

Primary Learning Outcomes:

Students will be introduced to classmates to build a foundation for future cooperative learning.

Students will be introduced to agriculture and its importance in the origin of food products.

Students will be introduced to food science through discussion of the processing of raw ingredients into finished food products.

Duration:

Ice Breaker Activity: 5 minutes

Discussion: 30 minutes

Total Class Time: 35 minutes

Materials and Equipment:

Raw ingredient/finished product flashcards. The flashcards can be downloaded from the SBOF website (www.uga.edu/discover/sbof) or lesson plan cd.

Safety:

There are no safety concerns associated with this activity.

Technology Connection:

Not applicable.

Procedures:

Teacher Preparation:

Cut out attached raw ingredient/finished product flashcards. To improve the durability of the flashcards, you may wish to laminate them.

Introduction:

Food science is the application of science and engineering to the production, processing, distribution, preparation, evaluation, and utilization of food. Food science is a multidisciplinary field, utilizing such subjects as biology, chemistry, physics, engineering, and mathematics. Food scientists work in government, academia, and industry in areas such as...



...**food chemistry** – Food chemists are interested in the composition and properties of food components and the chemical changes that occur during handling, processing, and storage. For example, a food chemist might study the effects of processing on the nutritional quality, color, or flavor of foods.

...**food processing** – Food processing engineers are responsible for the design of processes and equipment that transform raw ingredients into finished food products.

...**food packaging** – Food packaging engineers are responsible for the development of materials and packages that contain and protect products, while also fulfilling consumer needs for convenience and communication.

...**food microbiology** – Food microbiologists are interested in the microorganisms that cause food spoilage, cause food-borne illness, or improve the quality of foods. For example, molds are microorganisms that can lead to food spoilage, *E. coli* is a disease-causing microorganism, and *Lactobacillus spp.* is the microorganism responsible for transforming milk into yogurt.

...**quality control** – Quality control is a system by which a desired standard of quality in a product or process is maintained. Through regular product testing, quality control scientists ensure that consumers receive consistent, high-quality food products.

...**product development** – Product development is the process through which food scientists transform new food ideas into marketable products. When developing a new food product, product developers must decide what product will be produced, discover who will buy the product and how to make it unique, define what is in the product, develop all aspects of the product, and deploy the product into the marketplace.

The food industry, comprising food processing, handling, preparing, and serving, is the largest industry in the United States and the world, employing tens of millions of people. Further, the United States food industry grosses hundreds of billions of dollars annually.

In this activity, students will follow food from the farm to the table, thus discovering the importance of food science to our daily lives.

Ice Breaker Activity:

Pass out the flashcards to the students, making sure each student has only one. Explain to students that half of the flashcards depict raw ingredients and the other half finished food products. Students should move around the room, comparing cards with classmates. Once the students have found what they believe to be their match, raw ingredient and finished food product pairs should take a seat together and await further instruction.

Discussion:

Student pairs should introduce themselves, along with their raw ingredient and finished food product. During introductions, students should share with the class all information presented on the flashcard. Following each introduction, briefly discuss with students the processes involved in turning each of the raw ingredients into finished food products. A brief discussion of each pair follows.

Theobroma cacao and Hershey's Milk Chocolate®:

The cacao tree (*Theobroma cacao*), grown in such places as Costa Rica, South America, Africa and Indonesia, produces a fruit, or pod, about the size of a small football. Inside the pod are seeds, also known as cacao beans. To make chocolate, the beans are fermented for a week, dried in the sun, and shipped to chocolate makers. Chocolate makers roast the beans to bring out the flavor. Next, the roasted beans are winnowed, a process that removes the meat of the cocoa bean from its shell. Once roasted, winnowed, and blended, the beans are ground to form a viscous liquid called chocolate liquor. Chocolate liquor is pure, unsweetened chocolate. The flavor in this state is very bitter. Chocolate liquor can be poured into a mold to cool and solidify, forming unsweetened chocolate, or it can be pressed to separate the fat (cocoa butter) from a dry cake of cocoa. Grinding of the dried cake produces cocoa powder. The chocolate that we eat contains sugar, other flavors, and often milk. The chocolate maker adds these ingredients according to his or her secret recipe. Next, a special machine is used to massage the chocolate in order to blend the ingredients together and smooth it out. Conching, as it is called, can take anywhere from two to six days. Tempering is a carefully controlled heating process where the chocolate is slowly heated, then slowly cooled, allowing the cocoa butter molecules to solidify in a desirable crystalline form. Without tempering, the chocolate will not harden properly and the cocoa butter may separate out. These three steps, along with the selection of the cacao beans and the roasting method, are the art of chocolate making. These steps, which control the quality, flavor, and texture of the chocolate produced, are often closely guarded secrets!

(Source: <http://home.howstuffworks.com/chocolate1.htm>)

Animal Hooves and Jell-O®:

Jell-O® consists of the following ingredients: gelatin, water, sugar or artificial sweetener, artificial flavors, and food coloring. Gelatin is a processed version of a structural protein called collagen that is found in many animals, including humans, and it is gelatin that allows you transform Jell-O® into all sorts of different shapes. Collagen makes up almost a third of all the protein in the human body. It is a large, fibrous molecule that makes skin, bones, and tendons both strong and elastic. The gelatin you eat in Jell-O comes from the collagen in cow or pig bones, hooves, and connective tissues. To make gelatin, manufacturers grind up these various tissues and pre-treat them with either a strong acid or a strong base to break down cellular structures and release proteins like collagen. After pre-treatment, the resulting mixture is boiled. During this process, the large collagen protein ends up being partially broken down, and the resulting product is called gelatin. The gelatin is easily extracted because it forms a layer on the surface of the boiling mixture. Gelatin is a common ingredient in foods because it is so versatile. It can be used as a gelling agent (as in Jell-O®), as a thickener, an emulsifier, and a stabilizer. You'll find it in a variety of foods, including yogurt and chewing gum.

(Source: <http://home.howstuffworks.com/question557.htm>)

Corn (Zea mays) and Soft Drink:

The majority of non-diet soft drinks in the U.S. are sweetened with high fructose corn syrup (HFCS). HFCS is a corn sweetener found in numerous foods and beverages on the grocery store shelves. It is composed of either 42% or 55% fructose, along with glucose and higher saccharides. As such, HFCS is similar to regular table sugar (sucrose), which is disaccharide composed of fructose and glucose. HFCS is produced by processing corn starch to yield glucose, and then processing the glucose to produce a high percentage of fructose.

(Source: <http://www.nsga.org/softdrinks/CSDHealth/HFCS.html>)

Soybean (Glycine max) and Tofu:

Soy products are made from soybeans, which are part of the legume family. The bean resembles a small brownish-yellow or greenish pea. It is a complete source of protein, containing all 8 essential amino acids. Additionally, soybeans are low in fat and cholesterol free. Soybeans also have an abundance of phytosterols, which have been shown to lower the risk for certain diseases. Tofu, also known as soybean curd, is a soft, cheese-like food made by curdling fresh hot soymilk with a coagulant. Traditionally, the curdling agent used to make tofu is nigari, a compound found in natural ocean water, or calcium sulfate, a naturally occurring mineral. Curds can also be produced by acidic foods like lemon juice or vinegar. The curds then are generally pressed into a solid block.

(Sources: <http://www.yale.edu/uhs/departments/nutrition/relatedInfo/soy.pdf>,
<http://www.soyfoods.com/soyfoodsdescriptions/tofu.html>)

Cow and Milk:

Milk, from a cow, is an oil-in-water emulsion. If raw milk were left to stand, the fat (oil) would separate out, forming a cream layer. To prevent separation, milk is homogenized. Homogenization is a high pressure treatment used to reduce the size of the milk fat globules, therefore maintaining the emulsion.

(Source: <http://science.howstuffworks.com/framed.htm?parent=question147.htm&url=http://www.foodsci.uoguelph.ca/dairyedu/homogenization.html>)

Chicle (Manilkara zapota) and Wrigley's Chewing Gum:

Up until WWII, chewing gum was made of a substance called chicle. Chicle is a latex sap that comes from the sapodilla tree, a native of Central America. Because it is a type of rubber, like rubber bands, chicle does not dissolve when chewed. However, chicle is a good bit softer than rubber bands and softens more when warmed in the mouth. After WWII, chemists learned how to make artificial gum bases to replace chicle. These gum bases are essentially synthetic rubbers that have the same temperature profile as chicle. Gum bases (either natural or artificial) are

mixed with sugar and other flavorings to make chewing gum. When you chew it, the rubber releases these flavorings into your mouth.

(Source: <http://science.howstuffworks.com/question86.htm>)

Saccharum officinarum (Sugar Cane) and Sugar:

The production of sugar, from cane, is one of the oldest and best studied technological processes. As early as 327 B.C. Alexander the Great reported cultivation of sugar cane in India. At that time, sugar was extracted from the cane by chewing and sucking. Later, syrup was extracted by means of pressing and boiling the cane. This process, which was first practiced in India in about 300 A.D., became the basis for producing sugar in solid form. Sugar beets are the other major source worldwide of sucrose.

(Source: <http://www.monitorsugar.com/htmtext/HISTORY.htm>)

Coffea spp and Coffee:

Coffee begins as a bright red coffee cherry on a coffee tree. To prepare the pebble-like green coffee beans for roasting, growers process them using either the natural or the washed method. In the natural method, ripe coffee cherries are allowed to dry on the tree or on the ground before the beans are removed by hulling. In the washed method, the beans are immediately separated from the cherries, submerged in a vat of water, and then dried on large patios or with modern equipment. Green coffee beans are heated in a large rotating drum, and then their transformation begins. After about 5 to 7 minutes of intense heat, much of their moisture evaporates. The beans turn a yellow color and smell a little like popcorn. After about 8 minutes in the roaster, the "first pop" occurs. The beans double in size, crackling as they expand. They are now light brown. Very sour one-dimensional flavor notes are dominant, while more complex coffee flavors are yet to develop. After 10-11 minutes in the roaster, the beans reach an even brown color, and oil starts to appear on the surface of the bean. At this roasting time (different for each coffee, but usually somewhere between 11 and 15 minutes), the full flavor potential begins to develop in the beans, bringing all of their attributes into balance. The "second pop" signals that the coffee is almost ready. The moment that the coffee is released into the cooling tray is a memorable one. The smell of freshly roasted coffee fills the air.

(Source: http://www.starbucks.com/ourcoffees/coffee_edu3.asp?category%5Fname=The+Roast+Story)

Vanilla planifolia and Pure Vanilla Extract:

Vanilla is the world's most widely used flavoring. Vanilla flavoring is extracted from pods of the tropical orchid *Vanilla planifolia*. Freshly picked green vanilla bean pods have no characteristic aroma. Bean pods must be killed in hot water, sweated in the sun, dried in the shade, and conditioned in a closed box until they become brown and fragrant. This process takes three to eight months. From planting to market can take five years, making natural grown vanilla the second most expensive flavor after saffron. Pure vanilla extract is made from chopped vanilla beans soaked for days or weeks in dilute alcohol. Pure vanilla extract must contain the extractive material from 13.35 ounces of vanilla beans per gallon and at least 35% alcohol by volume.

(Source: <http://www.cemistry.org/education/chemmatters.html>)

Brassica spp and French's Classic Yellow®:

In order to make mustard, the seed must be crushed and its hull and bran removed. The seed may then go through further grinding and crushing. A liquid such as water, wine, vinegar, beer, or a combination of several of these liquids is added, along with seasonings and other flavorings. The mustard is mixed, in some cases simmered, and cooled. Some mustard is aged in large containers before it is bottled and shipped to stores and customer.

(Source: <http://www.mustardstore.com/aboutmustard/default.htm#history>)

Tomato (Lycopersicon esculentum) and Ketchup:

Ketchup has not always been made out of tomatoes. Ketchup began as a general term for sauce, typically made of mushrooms or fish brine, herbs, and spices. Later it was reformulated to include anchovies, walnuts, and kidney beans. The recipe for modern ketchup includes tomatoes, vinegar, sugar, salt, allspice, cloves, and cinnamon. Onions, celery and other spices are also frequent additions.

(Source: <http://www.fact-index.com/k/ke/ketchup.html>)

Eggs and Hellmann's Real Mayonaise®:

Mayonnaise is a thick, creamy sauce that is an emulsion of oil, egg yolks, lemon juice or vinegar, and seasonings. In mayonnaise, egg yolk (which contains lecithin, a fat emulsifier) is used to maintain the emulsion. Commercial mayonnaise, which will last up to six months in the refrigerator, contains (by U.S. law) at least 65-percent oil by weight (except reduced-fat and fat-free mayonnaises). The standard of identity law also requires that all commercial "real mayonnaise" use only egg as an emulsifier. Reduced fat mayonnaise, which isn't considered real mayonnaise, usually contains modified food starch, cellulose gel, and other thickeners and emulsifiers. Mayonnaise is also used as the base for other sauces, such as tartar sauce and thousand-island salad dressing.

(Source: <http://www.howstuffworks.com/question617.htm>)

Wheat (Triticum aestivum) and Bread:

Wheat flour, if mixed with water and kneaded, becomes very elastic. The flour-and-water mixture in bread becomes stretchy like a balloon because of a protein in wheat known as gluten. Yeast added to the dough respire, producing carbon dioxide gas. Gluten gives bread dough the ability to capture the carbon dioxide produced by yeast in tiny flour "balloons." The expansion of these caused bread to rise and give it its characteristic texture and appearance.

(Source: <http://home.howstuffworks.com/bread.htm>)

Mallow Root (Althaea officinalis) and Marshmallows:

Technically, marshmallows are a confection, or candy. Marshmallows have been around in the current form since the mid-1800s. They are called "marshmallows" because the early recipe called for sap from the root of the marshmallow plant (*Althaea officinalis*). The marshmallow plant has a mucilaginous ("jelly-like") root. Later, the root was replaced by gelatin, which is still used to make modern marshmallows.

(Source: <http://science.howstuffworks.com/question128.htm>)



Arachis hypogaea (Peanut) and Peanut Butter:

Nearly half of the US peanut crop was used to make peanut butter in 2001. Runner peanuts, used for peanut butter, are grown primarily in Georgia, Alabama, and Florida. The shelled peanut is the seed of the plant. After harvest, shelled peanuts are shipped to peanut butter manufacturers who inspect the peanuts to ensure high quality then roast them in special ovens. After roasting, the peanuts are fast-cooled by suction fans that circulate air quickly. Rapid cooling is necessary to halt the cooking process, retain an even color and prevent the loss of too much oil. Another machine rubs the peanuts gently between rubber belts to remove the outer skin—this is called blanching. The kernels are split, the hearts removed and the peanuts are cleaned and sorted a final time. Finally, the peanuts are ground in two stages (one long grinding would produce too much heat, damaging the flavor of the peanut butter). In the first stage, the peanuts are ground alone. In the second stage, salt, sweetener and stabilizer (to keep the oil from separating) are added. Peanut butter today is remarkably like that made 100 years ago. It contains, by law, a minimum of 90% peanuts, with no artificial sweeteners, colors or preservatives. Some brands add about 7% natural sweeteners and 1% salt for taste, plus a stabilizer to keep the peanut butter fresh and the oil from separating. "Old-fashioned" or "natural" peanut butter does not have the stabilizer so the oil will separate and should be stirred back in before using. Peanut butter does not need to be refrigerated.

(Source: <http://www.peanutbutterlovers.com/howmade/index.html>)