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# Inside Out: An Up-Close Look At Foods We Eat

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"Why does my Mom always make me eat healthy foods and where does it go after I swallow… What type of food is used to make Apple Jacks and Rice Krispies… When we eat meat, are we eating vegetables too? Why do farmers use pesticides and genetic engineering to produce foods and which method is better…?" These and other questions sparked by inquisitive young learners are addressed in my curriculum unit, INSIDE OUT: AN UP-CLOSE LOOK AT FOODS WE EAT. Targeted at students in Grades 1 and 2, INSIDE OUT can be modified to accommodate young learners in Elementary Grade Levels 3 - 5. The unit covers a six to seven week period, beginning at the end of March (first day of Spring) through mid-May.

Several disciplines are encompassed in this unit and incorporate the use of logical and analytical thinking skills: Science (the human digestive system, plant growth, food and food processing, hands-on implementation of the Scientific Method), Math (sorting, classifying, prediction, estimation, graphing), and Language Arts (accessing Internet data, research and recordkeeping, storywriting, non-fiction journal writing). "Objectives" and "Skills Focus" are provided, along with question-and-answer support information based on frequently presented student inquiries.

I believe that children ages 6-7 are sophisticated enough to grasp scientific terminologies and related concepts, particularly when presented in an interactive, hands-on basis. Based on this expectation, "INSIDE OUT" will (1) provide students with a better understanding of the origins of food and the food chain; (2) motivate students to make healthy, nutrition-based choices when selecting foods, (3) spark enthusiasm in understanding the inner workings of the human body, and (4) lay the groundwork for consumer activism and motivate students to explore the wonderful world of Science.

## SECTION ONE: WHENCE IT CAME

Objective: Students will learn to identify the origins of meats and vegetables consumed by humans on a daily basis. Students will classify foods (meats, dairy products, grains…) and be able to create a food pyramid. They too will recognize the "chain" and interdependence humans have on plants and animals. This portion of the unit will include a trip to a major food store and a dairy/produce farm.

Skills Focus: Categorization/classifying/sorting/discrimination; strengthening fine motor skills; developing

language arts through role play, journal writing, becoming familiar with non-fiction literature; logical thinking.

Words to Know:

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| agriculture | farm | | grains | | produce | silo | barn | crops fruits | | vegetables | seeds | | pods | stems | leaves tractor |
| chicken | hen | | chick | | rooster | nanny | billy | kid | | | | | | | |
| lamb | | ewe | | ram | | cattle | | dairy | bull | cow | | | | | |
| calf | | poultry | goose | | gosling | | gander | drake duck | | | | | | | |
| duckling | tom turkey | | chick | | pig | sow | piglet meat | | fruit | | plants | vegetables | pulses legumes tilling | | |
| plowing | crop rotation | fish | | whiting | tuna | salmon cod | | | | | | | | | |
| sardines | flounder | whiting | halibut | | food pyramid | | | | | | | | | | |

When first introducing this subject matter, I was taken aback to observe how students could not make the connection between hamburger and cow, bacon and pig, peanuts and plants. Taking nothing for granted, before beginning this unit, I recommend canvassing your students to determine how much they know about food origins. This can be achieved through a question/answer session where data is recorded on a K-W-L chart*.

Have your students cut out pictures of a wide range of foods and classify them in fruit, vegetable, or meat family groupings. As their understanding becomes more advanced, classification can be broken down even further to include grains, pulses, dairy, meats, poultry, fruits and vegetables. As an interactive complement, create an oversized food pyramid grid. Students can classify foods thereon.

## Related Activity 1: Food Classification Game

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This activity serves as a fine motor skill/logical thinking assignment. You will need:

*K= what you know, W = what you would like to know, L = what you have learned. After completing each unit segment, or as a culmination to the entire curriculum unit, go back to the L and record the children's responses. The use of the K-W-L format serves as a helpful method of monitoring students' understanding of learned subject matter.

*pictorial magazines such as Good Housekeeping, Woman's Home Journal, Family Circle or circulars from major grocery stores

*an oversized (18" x 20") laminated poster board broken down into three columns labeled Plant/Animal/Other.

Have your children cut out a minimum of 10 approximately 3" x 4" pictures of foods they enjoy eating. This cutting exercise can be used as a homework assignment. I often include a note to enlighten parents that allowing their young ones to participate in such paper-cutting activities aids in the development of handwriting skills.

Laminate the cut out pictures for reuse purposes. Use teacher tack, available at any office supply store, to affix pictures to the poster board categories. Conduct the food classification segment as a whole group classroom exercise. Using the oversized laminated poster board, have your students sort each food into one of the three categories.

(Be ready for a good laugh. One of my students cut out a picture of a bag of peanuts. When asked to think about the origin of this food, he and several others exclaimed, “Peanuts come from a peanut tree… the supermarket… the circus.” Such responses would go under “Other.” At this point, record all student responses. As the unit progresses and food origins are accurately established, revisit the chart to make necessary corrections and picture/category adjustments.)

## Related Activity 2: What Part Is It?

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Many young learners are unaware that fruits and vegetables are plant components. This activity will shed a bit of light on additional ways to classify plant foods.

To complete this show-and-discover activity, you will need

*an oversized (18” x 20”) laminated poster board divided into columns labeled Roots, Tubers, Stems, Leaves, Fruits, and Seeds.

*a cutting from a bunch of fresh collards or kale, one piece of celery, a yam, an asparagus tip, a carrot, a white potato, an orange, a small head of cabbage, a few string beans and snow pea pods. (Vivid photos or pictures of these foods can be used as an alternative.)

Randomly select students to define the parts of a plant. At this age, they will probably have some understanding of the words root, stem, leaf, seed and fruit and will note them accordingly. Add tubers their list.

So that our young learners will have an accurate sense of plant parts, highlight a few of their notable features:

The STEM usually grows upright and above the ground. It supports the leaves and reproductive organs of a plant and receives a lot of sunlight to help that plant grow.

TUBERS are huge parts of a stem that often grow underground. Tubers have “eyes”. Those eyes often sprout new stems that grow beneath the ground.

ROOTS grow beneath the ground and absorb food and minerals from the soil. They also help keep the plant in place. Some roots store food for the rest of the plant to use.

LEAVES grow above ground and absorb food and minerals from the soil. They also make most of the food that plants need to live and grow.

FRUITS are portions of flowering plants that contain a plant’s seeds. Many fruits are nutritious and delicious to eat.

SEEDS contain miniature plants and a food supply surrounded by a protective seed coat. They are formed

when flowers are pollinated and the sperm from the pollen fertilizes the egg in the ovary of the flower. The fertilized ovary becomes the fruit, containing the seeds. When seeds ripen and are exposed to water, they germinate to produce new plants. Some seeds are contained in pods, a fruit that contains the developing seeds. Many types of beans and peas, also called pulses or legumes, come from pods.

Show and Discover. As a prelude, show the bunch of collards. Ask your students to think about what part of a plant it might be. Because collards have a leafy quality, the children will probably identify it as a leaf. “Collards” will be placed in the appropriate category. Continue the process, examining and discussing the characteristics of each presented edible plant: asparagus tips are stems; a yam and carrots are roots, a white potato is a tuber, an orange is a fruit, kale and a small head of cabbage are leaf vegetables, and so on. Include these foods beneath the appropriate category on the poster board.

A visit to the grocery store is a terrific complement to the activities noted herein. Have the children visit the fruits and vegetables department and classify found food products as noted herein.

Children’s Books and Video Recommendations

Animal Families
Whose Baby Is It?
The Cow That Went Oink
The Egg
A Calf Is Born
Milo and Otis

## WHAT WE WANTED TO KNOW!--Discoveries from Our K-W-L

***What is farming and why is it important?***
Farming is a way of life that supplies us with the majority of our food supply. Most food supplies are produced on farms. Farming, however, is not limited to the production of food. It also provides us with materials used for clothing and shelter.

***What types of food products are produced on farms?***
There are many different kinds of farms. Some farms grow and raise a little bit of everything and are known as mixed farms; others cater to the production of one particular product and are known as specialized farms.

Some farms cater specifically to the production of crops. Crops are plants, and they include cereals such as

oats, rice, corn, millet, wheat, and barley; root crops such as sweet potatoes, and turnips; tubers that include potatoes and yams; pulses that include dry beans and peas; fruits and vegetables; oil-bearing crops like soybeans and coconuts; sugar-bearing crops such as sugar beets and sugar cane; nuts and cocoa, coffee and tea; fiber-producing plants like cotton and flax; and wood-producing plants such as like oak, maple, and pine.

Some farms cater specifically to livestock and other animals. Cattle, chickens, goats, hogs, and sheep are raised on livestock farms. Animals raised here are used primarily as food for meat production. Cows used primarily for milk production are raised on dairy farms. Dairy farms are found near big-city markets. Some fish are raised in ponds in fish farms. Farms used to raise chickens, turkeys, and other types of poultry are called poultry farms. Some poultry farms are used solely for the production of eggs and grow no crops at all

***How does farming in the past in our country differ from farming today?***
Long ago, many people throughout the world spent endless hours in search of food. People like the Native Americans, got the majority of their food by gathering wild plants, hunting, and fishing. They often used simple, handcrafted tools to find food. They could gather only small quantities of food at a time. The early settlers worked the land to raise crops. Family members and friends worked long, hard hours tilling the soil. They used plows pulled by horses and/or oxen to prepare the soil, planted seeds, depended on rains and natural occurrences to help their crops grow. Often, they managed to raise just enough food for their immediate family members. Sometimes, insects destroyed the crops. At other times, dry spells and bad weather conditions interfered with crop production. Life was difficult. Nevertheless, families and communities often worked together so that food was available to all. Farming, long ago, was a widespread way of life.

Today, Science and modern technology have improved the farming industry. Today, food is produced to feed an enormous number of people. The production of crops has been made simpler: machines such as chisel plows, planters, and cultivators are used to quickly till large portions of land and plant seeds. Irrigation techniques are used to help water crops where too little water exists to grow crops. Farmers and scientists work together to make sure that the soil contains enough nutrients and water to produce healthy crops. They ensure that the earth contains enough nutrients to help plants grow. Using special machines, they till the soil, loosening it to kill and remove weeds and to circulate water and air. They cultivate the land, sometimes applying herbicides to lessen weed growth. Many farmers apply pesticides to ward off harmful insects. Others use organic farming. They rely on the use of natural substances and crop rotation to control pests. Crop rotation is the rotation of crops from year to year to reduce the need for chemical fertilizers and pesticides.

***Do all vegetables grow above the ground?***
Many vegetables grow above the ground like lettuce, cucumbers, kale, string beans, and broccoli. These vegetables are often leafy or pod-like in form. Some vegetables, however, grow with a major portion of the plant beneath the ground. These are known as root vegetables like carrots and turnips, or tubers like potatoes and yams, and some fruits and seeds, like peanuts.

***Where do most fruits grow?***
Many fruits grow on trees or vines. Fruits like cherries, bananas, oranges, apples, pears, peaches, and oranges grow on trees. Others like grapes, pumpkin, and watermelon grow on vines. They are easy to identify because they contain seeds and/or pits.

***What is cereal and where does it come from?***
When we eat Corn Flakes, Apple Jacks, Rice Krispies, or Wheaties, we are eating cereal foods. Cereals, also known as grains, are seeds that come from such plants as corn, rice, barley, oats, sorghum, and wheat. Grains are usually ground into meal or flour and are processed to create many of the commercial foods we eat such

as bread, rolls, and many of the popular cereals we consume.

***What is the difference between root plants and tubers?***
Carrots, beets, and radishes, are thick roots that grow beneath the ground. Other plants, like potatoes, artichokes, and yams, are tubers. Tubers also grow beneath the ground, but they have “eyes” or buds that can sprout new shoots or stems. Their stems often grow beneath the ground.

***Are eggs considered meat or poultry?***
According to nutritionists, eggs, a protein food, is classified as meat.

Someone said that when you eat meat, you’re eating vegetables too. How can that be?

Living things depend on one another. Let’s look at a few examples. When we eat hamburger, beef ribs, or beef bacon, we are eating meat that comes from a cow. That cow delights on grass, which is a plant. When we eat barbecued chicken, chicken tenders or buffalo wings, we are probably eating a hen. That hen eats corn and other grains, which are plants. When we eat salmon, tuna, or sardines, we are eating flesh foods from the sea or surrounding fresh waters. Many fish eat plankton--plant and animal life forms found in these types of water. Again, plants are consumed. Plants are continuously involved in this chain. Based on this observation, when you eat meat, you are eating vegetables too!

***Is there a formal name for the interconnectedness that exists between plants and animals?***
Yes. The interconnection between animals and living things as noted above is known as the food chain.

## SECTION 2: OUR DIGESTIVE SYSTEM

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Objective: Students will learn where digestion begins, how food is digested and used to help keep our body strong, integral parts of the digestive system. Students will be able to recognize the difference between omnivores, herbivores, and carnivores.

Skills Focus: Understanding the scientific method (capably identifying Purpose, Hypothesis, Materials, Procedures, Observations, Application, Conclusion); graphing/ classifying/sorting/; understanding the components and inner-workings of the human body.

Words to Know:

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| carnivore | herbivore | omnivore | digestion | digest | esophagus | stomach | saliva | | gall bladder pancreas | colon (large intestines) | small intestines | liver | | epiglottis | | | |
| palate | | bile | enzymes | | acids | | tongue | taste buds | masticate | molars | | | | | incisors | bicuspids | |

If we were to enter our bodies, we would see another world right within ourselves. One of those worlds is the digestive system. Within us, are a series of organs, body parts that work together to help us break down foods we need to keep us healthy and strong.

Suggestion: Take photographs when conducting the Related Activities that follow. They can be included in Big Book preparation or as part of a bulletin board display. We used them for our Science Fair display on Digestion.

**Related Activity #1: Where Digestion BeginsAn Experiment**

Each student will need:

* a sheet of paper folded into thirds with the numbers 10, 30, and 50 printed in each

section.

* three 1” wedge slices of apple

* their teeth and saliva

PROCEDURE

(1) Place apple wedge in mouth, chew 10 times, expel onto sheet of paper in the area marked 10.
(2) Repeat step 1, this time chewing 30 times, expel masticated apple onto the area marked 30.

(3) Repeat procedure, this time chewing 50 times, expel apple to the area marked 50.
(4) Compare and examine results; evaluate outcome.

My students had a ball conducting this experiment, although we ran into a few glitches. The children hypothesized that digestion begins in the mouth. They followed the procedures to the letter, and there were quite a bit of moans after the expulsion of chewed fruit. Several variables slightly altered our results. Some students found that after chewing 10 times, they did not produce a lot of saliva. According to their observations, the masticated apples were “kind of crunchy.” Two students were unable to keep the apple in their mouths after 50 chews; they accidentally swallowed the experiment. Overall, however, they discovered that the more you masticate your food, the more that food is initially broken down, making it easier to swallow and pass through other portions of the digestive system. The children were also able to make sense of the application of their findings, noting that this information is helpful because “it teaches children and grownups to masticate their food.” According to our first graders, “When we chew our food thoroughly, it is easier to swallow. It also helps to make the digestion process in our stomach and intestines easier too! When our food is well digested, our body can use all the vitamins and minerals found in food to keep our body strong.”

**Related Activity #2: The StomachUp Close**

The digestive organs of pig are very similar to those found in humans. Visit your neighborhood butcher or major grocery chain to obtain a pig's stomach. My first graders had an opportunity to closely examine a whole pig stomach. Before making this presentation, I released a note to parents to make them aware of our classroom activity. Additionally, recognizing that a few of my students were Muslim and Jewish, I asked whether their children could participate in this hands-on, visual activity. Permission slips to observe the stomach were forwarded and signed off by each parent. Be certain to double-check with your parents before conducting this presentation.

**Related Activity #3: The Match Game**

This activity will serve as a review and will conclude this unit.

You will need:

* an oversized display board with the outline of a person printed thereon

* a diagram of the human digestive system (enlarged x 150-200% depending on need: available on yahooligans.com)

* 1½ " stick-on digestive organ identification tags

*Children's Book, Web Sites and Video Recommendations*

What's Inside My Body?--A First Guide To The Wonders and Workings of the Human Body.
Inside the Human Body
My Five Senses
The Human Body
My Body (Grade 4) at yahooligans.com
Digestion by PBS, 3-2-1Contact

## WHAT WE WANTED TO KNOWDiscoveries From Our K-W-L!

Via shared reading experiences using non-fiction materials and Internet research, we learned about the components of the digestive system and created a diagram of the applicable organs. The children learned that the mouth, esophagus, stomach, gall bladder, pancreas, liver, small and large intestines work together in the digestion process. They had an opportunity to see how acids and enzymes help break down hard-to-digest foods like meats and starches.

@4H(afterH):Why do people eat plants and animals? People eat a wide variety of foods to help keep their bodies healthy and strong. Different foods provide energy and contain vitamins and nutrients that help keep our bodies in good working condition. People depend on plants and animals as food sources because they contain these energy sources, vitamins, and nutrients. Also, people, as are other animals, are classified by the foods that they eat. People who eat plants are called herbivores. Those who eat meat are called carnivores. Most of us eat both of these food sources, and we are called omnivores.

***What are the components of the human digestive system?***
The human digestive system consists of the mouth (including teeth, tongue, taste buds, epiglottis, palate); the esophagus also known as our food pipe; the stomach, which uses acids and enzymes to break down food even further so it can pass through other parts of the body; the liver, which produces bile, a chemical used to help break down the food; the gall bladder, which stores and releases bile to the small intestines; the pancreas, which supplies enzymes that help break down our food; the small intestines, which digests the food into minute particles so that it can be absorbed and used where needed within body cells; the large intestine or colon, which helps to discard waste products from our body. Despite these findings, additional questions were raised, sparking the desire to learn more about the subject matter.

***How long does it take for the human body to digest food?***
Approximately 8-12 hours.

How long is the esophagus?

It is approximately18 inches long.

***If you eat a sandwich and you stand on your head while chewing and swallowing, will your food come back out?***
You would think so, but remarkably enough, the digestion process continues and your food will go down. The muscles in your digestive system are powerful, moving the food downward. Swallowing, peristalsis, stomach and intestinal activity help to continue the digestion process.

@4H(afterH): What are salivary glands, and what do they produce? The salivary glands are found beneath your tongue and inside your cheek. They produce saliva, a liquid found in the mouth. It helps to start the digestion process.

***What is peristalsis and what is its purpose?***
Peristalsis is the squeezing of muscles in the intestines. Peristalsis helps food move through your digestive organs.

***What chemical used to breakdown food is released to the small intestine by the gall bladder?***
Bile is the chemical. It helps to break down food so that it can travel from the stomach into the intestines into other parts of our body.

What part of the body does the most digestion?

The small intestines conduct the most digestion.

***What is waste, and through which part of the body is waste released?***
After your body has digested all of the food, it discards what it does not need. The unneeded food is called waste. Solid waste is stored in the large intestines until it is ready to be expelled. (Liquid waste, produced in our kidneys, is stored in the bladder. Our liquid waste is called urine.) When solid waste leaves our body, it is released through the rectum as feces.

***Why is the mouth so important to digestion?***
Think about the mouth and what is contained therein. We have molars, incisors, and canines, teeth that are used to grind, bite and chew our food. By using teeth, food is broken down into small pieces. We have our tongue and taste buds, which contribute to our ability to taste and feel the texture of foods we eat. They too help break down food so that we may swallow. The beginning of the digestion process occurs in our mouth. That is why our mouth is so very important.

***What is a palate? Does it help food go down the right pipe? If not, what does?***
We have two pipe-like tubes that begin in the back of our mouths: our windpipe (the trachea) and our food pipe (the esophagus). What do you think would happen if swallowed food went down into our windpipe? You've guessed it. We would perhaps be unable to catch our breath, cough and/or choke. What parts of the body help protect against such occurrences?

The palate, which separates the mouth from our nasal cavity, is the roof of the mouth. Divided into a hard and soft part, it does not help food go down the esophagus. During swallowing, the palate blocks off the entrance to the rear nasal passage. The part of the palate we see in the back of our mouth is called the uvula. It rises up and down when we swallow, as the palate rises and descends. Another body part, the epiglottis (located at the back of the mouth at the top of our windpipe), serves as sort of a safety valve. The epiglottis helps to prevent food from going down the wrong pipe.

***What are we doing when we masticate our food?***
We are chewing our food.

***What do the pancreas, liver, and gall bladder do?***

They help make acids and enzymes needed to break down food. Acids and enzymes are chemicals that are used to break down foods in the stomach and small intestines. Note also that the liver also helps clean your blood.

## 3. SECTION THREE: WHICH DO WE USE?

Objective: Chemical fertilizers and pesticides and genetic engineering are different ways that farmers/scientist produce healthy foods that grow quickly and more abundantly. Which is the better method? How might these chemically treated and/or genetically engineered foods affect us?

Through interactive excursions, non-fiction storytelling, Internet research, role play, and shared reading experiences, our young learners will discover scientific views and consumer perspectives in addition to drawing their own conclusion.

Skills Focus: Strengthening oratory skills and developing language arts through role play and Internet use/logical thinking and problem solving.

Words to Know:

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| transgenic crops | genetic engineering | transfer | genes | pesticides | disease | organic foods | organic farming | pest control | cells | DNA | crop rotation | traits | perishable |
| consumer | biotech scientist | lobbyist | | | | | | | | | | |

Related Activities: Trip to Dudley Farm in Guilford, CT

Excursion to Stop ‘N’ Shop Supermarket

Experiment: Can Pesticides Affect Humans**

Internet Fact Find

Class Opinion Poll**

## WHAT WE WANTED TO KNOWDiscoveries From Our K-W-L!

We scheduled and participated in several Internet Research Sessions with our Library Media Specialist to find information concerning different ways of producing healthy foods. Coupled with information supported by scientific journals (see references in Adult Bibliography), and classroom discussion, our students were able to discover the following information. Our findings sparked interesting viewpoints and debate.

***What impacts the growth of healthy crops and how do farmers and scientists help to make it better?***

Many factors impact the growth of healthy crops. Weeds, plant diseases, and insects can be harmful to crops, threatening their healthy growth and development. Many farmers and scientists work together to combat this problem. Today, many farmers control pests by using chemicals called pesticides and herbicides. Although these chemicals are useful, they can pollute our environment if they are not used properly. They can also cause health problems for people and animals.

**These activities are the result of questions and discoveries raised by the students.

One way that some farmers and scientists are attempting to combat this problem is through organic farming. Natural substances rather than chemicals are used to fertilize soil and control pests. Many farmers conduct organic farming by rotating their crops each year. Crop rotation helps fight against disease and insect pests in a special way. Usually, if certain crops are planted and grow in the same field each year, diseases and insects that are attracted to those plants will continue to flourish. When crops are rotated, the same plants are unavailable, and often diseases and insects die out. Organic farming is a good alternative, but it is a long process.

Some scientists and farmers believe that they can make better food products by transferring genes from one living thing to another. They use the good qualities of those genes to enhance food products. This process is known as genetic engineering. Here are a few examples.

Tomatoes are very perishable, particularly when transported from one portion of the country to another. After fruit ripening, they could mold and become rotten before they are delivered to their place of destination. (Some tomatoes have been genetically altered so that ripening is considerably delayed. As a result, we can transport tomatoes when they are hard and green, and allow them to ripen in our homes.) They could also be frost bitten if grown in climates where temperatures are not conducive to tomato growth. How could we help tomatoes stay fresh when transporting them from one region of the U.S. to another locale? How could we prolong their shelf life? Some scientists have found a gene in Arctic flounder that helps that species of fish survive in freezing waters. These scientists have experimented with this gene and have been able to transfer and place it in the genes of tomato cells. These combined cells grow into tomato plants. The results: tomatoes that resist the cold have been created. The tomato has been biogenetically engineered. Many of these scientists say that biogenetic engineering will not affect those who consume tomatoes.

Some food crops, like potatoes, cabbage, and lettuce are attacked and sometimes harmed or destroyed by insects. In an effort to combat this problem, scientists have created potatoes, cabbage, and lettuce that have been biogenetically engineered to fight against insect infestation. An insect repellant gene has been transferred into the plants, and they make the insecticide themselves. This strengthens the plants insect resistance while reducing the need for insecticide use.

***What are transgenic crops, and how are they created?***
Transgenic crops are crops that have undergone genetic modification. Let’s take a simplified look at the process. Biotech scientists are able to isolate and insert genes that have a desirable characteristic from one living thing into another. A desirable genetic trait might be to enhance nutritional value, pesticide and/or herbicide resistance, or the ability to ward off plant viruses. The host plant into which the gene is transferred soon takes on that desired trait. That crop is a transgenic crop.

***Do genes have to be transferred from the same species or organism?***
No. Genes can be transferred from totally unrelated species or organisms, for example, that gene that helps Arctic salmon endure cold being transferred into a tomato plant.

***What types of edible plants have been genetically engineered and why?***
Broccoli, melons, raspberries, and tropical fruits, peas, peppers, and tomatoes have been genetically modified to control ripening. This helps to improve shelf life and the quality of the food when it arrives in food stores like Shaw’s and Stop ‘N’ Shop. It also prolongs the “freshness and durability of the food”, particularly in tomatoes.

Corn, cabbage and other related vegetables in this family, potatoes, lettuce, coffee and apples have been

genetically modified to create insect resistant species. As a result, these vegetables are inherently able to protect themselves against harmful insect pests, and the need for insecticide use is reduced.

Soybeans, corn, tomatoes, wheat, and rapeseeds used in canola oil have been genetically modified to be herbicide tolerant. These transgenic plants can survive herbicide applications that will kill all weeds.

Corn, sunflowers, soybeans, and other plants have been genetically modified to enhance nutritional value. Vitamins, amino acids, and other nutrients make these plants more nutritional.

Many plants like potatoes, cantaloupe, squash, cucumbers, corn, soybean, and grapes are subject to plant viruses. These plants have undergone genetic modification for viral resistance. Because of genetic modification, plant viruses are reduced and the use of insecticides minimized.

***Have all of the plants noted above been genetically modified in America?***
No, they have not. But, since 1995, millions of acres of transgenic crops have been planted in our country.

***Do all people believe that transgenic crops are healthy?***

Some peopleparticularly consumers (people who purchase and use these products)--disagree with scientists and farmers who use genetically engineered farming techniques. They believe that more research needs to be conducted, that people and animals may be harmed by long-term consumption of such foods. Some consumers are fearful that transferring genes can result in allergic reactions in humans. This viewpoint has been raised because a small number of individuals who have eaten genetically engineered soybean-based products have had allergic reactions to these foods. Some people believe that scientists are making foods poisonous, harmful, and unsafe when they introduce insect resistant, herbicide tolerant, and viral resistant genes to specific plants.

Many vegetarians and religious groups who are restricted in eating certain foods believe that because a fish gene has been implanted in a tomato, it is hard to determine whether the GM tomato is a “vegetable.”

Important to know, however, is that the genetic modification of foods is no new phenomena. All existing crops, for example, have been “naturally engineered” by bacteria that move genes around without human intervention. The cells of Agrobacterium are even used today to accomplish genetic engineering of crops. (Agrobacterium--a naturally occurring bacterium that accomplishes genetic engineering on its own, without human intervention-- has a plasmid (circular piece of DNA) that it can transfer to plant cells, conferring new genetic traits. Scientists can also splice genes that we want [like insect resistance] into such plasmids and transfer them into plants.)

***Can herbicides and pesticides be absorbed by plants? If they can, can’t those plants be harmful to humans and animals?***
This question was overwhelmingly repeated and sparked debate among our young learners. Many conjectured that the answer to both was “yes.” So the children could visually grasp that plants have the ability to absorb chemicals from their environment, we conducted the following experiment:

**Activity 1: Can Harmful Chemicals Be Absorbed?**

MATERIALS

We used

*six beakers of water: two labeled “organically grown”, two labeled “pesticide”, two labeled “herbicide”
*six leafy-tipped celery stalks
*red and blue food coloring
*plastic knives (one per student)
*magnifying glasses (one per student)
*Science journal (with Page Headings Hypothesis, Materials, Procedure, Observations, Results, Application) to record our findings

PROCEDURE

Note: The children were advised that because we could not actually use hazardous chemicals like pesticides and herbicides in class (a New Haven Public School mandate), we would use colored water to represent these chemicals.

(1) Pour 2” inches of water into each beaker. Leave one beaker color-free and label it “organically grown”.

(2) Add 10 drops of red food coloring to two of the beakers labeled “pesticide”. Stir until the water therein is completely red.

(3) Add 10 drops of blue food coloring to two of the beakers. Stir until the water therein is entirely blue. Label these beakers “herbicides.”

(4) Place two celery stalks in each beaker. Sit each container on the window ledge over night.

(5) Next day, examine stalks. Evaluate outcome.

Findings. The following day, the children observed that the celery stalks labeled “pesticide” and “herbicide” had turned red and blue respectively. The ones placed in uncolored water remained green. The children were amazed that the stalks had changed colors, noting the celery “drank up” the water. The children were each given an opportunity to slice a small piece of celery from each stalk. Using their magnifying glass, they further discovered that the veins within the stalk took on the color of the liquid. They deduced that if plants “drink up water that contain nutrients from the soil” and that soil contains herbicides and/or pesticides, those chemicals could become part of that food. If we eat the plants or other animals that eat these plants, those chemicals might in turn enter our body and could be harmful to humans and other animals.

Each child recorded the outcome of the experiment in his/her Science Journal. Many additionally noted that:

*farmers and scientists should be careful about using pesticides and herbicides on foods
*people must be careful when selecting foods to eat

*we should wash foods before we eat them or cook them thoroughly

*we should eat less foods that have been grown using pesticides and herbicides.

The previously noted experiment sparked a lot of discussion and an additional question:

***Can plants that have pesticide resistant genes be harmful to people and animals too?***
The answer is “yes, if the gene causes the plant to produce its own pesticide, that is in turn toxic to humans. Just as in the case of sprayed pesticides and herbicides that are taken up by that plant, the same holds true for transgenic versions.

This response yielded a large number of students asking, “So, which foods are best to eat?”

**Activity #2: Opinion Poll: Which Foods Are Best To Eat**

This activity serves as a unit review. It also serves as a Language Arts/Social Development/Social Studies/Math component of this section defined as follows:

Language Arts. Students will use oral language to organize and express ideas. Logical thinking will be used to support expressed ideas. Role play will be used to assist in creatively expressing ideas. Findings will be noted on paper, reinforcing the connection between the written and spoken word.

Social Development. Sharing, taking turns, coming to consensus, and communicating effectively is a sophisticated skill for young learners. This interaction serves as a challenge and positive reinforcement to problem solving and sharing through social interaction and verbal communication.

Social Studies. Children will learn that within our society, there are consumers and producers, that these individuals and lobbyist groups can voice concerns and discuss issues. This role play activity will help them recognize that opinions count.

Math. Graphing/numeric comparison will be used to record and evaluate student preference.

You will need:

a camcorder (optional)
chart paper to graph results
a raw potato

Guidelines

*Children come to group on the rug and are seated in a circle. Students will take turns in speaking by passing the potato. Whoever is holding the potato has the floor.

*Each will be given a choice to pretend they are a farmer, scientist, or consumer.

*After making their selection, all class members are given the opportunity to share their point of view. (Model the responses, i.e., “Hello. My name is _____, and I am a _____. I believe that _____ foods are the best to eat because _____.)

* All participants must support their viewpoint.

Presented questions:

Which is best, to eat:

*foods that have been chemically treated with pesticides and herbicides
*foods that have been genetically engineered to ward off insect and plant pests
*foods that have been organically grown

Based on previously explored information, my students were aware of the fears that some people have concerning the use of GM and chemically treated plants (potatoes, tomatoes, corn…) and advocacy views held by many in the scientific and agricultural field. That prior knowledge served as a springboard for opinions.

The children came up with fascinating, valid responses. These key views were consolidated and recorded as follows:

Scientist Views. We should grow genetically engineered foods because they become resistant to diseases and pests, may have more vitamins and minerals to help people stay healthy, and can produce more food to feed our increasing population. We don't think there will be a lot of problems growing genetically engineered foods.

Farmer Views. We should grow fruits and vegetables and spray them with pesticides to keep insects away. We should use herbicides to get rid of weeds. People can always wash the pesticides and herbicides off before they eat the foods. That way, they will be safe to eat.

Consumer Views. We should eat foods that are organically grown because nothing has been done to them. We should not eat foods that are genetically engineered or sprayed with pesticides and herbicides because we might become sick.

Graphing Our Findings. After listening, recording, and consolidating responses, students were asked to think individually about the presented views regardless of their previously assumed roles. They were asked to select only those viewpoints that they agreed with most. We tallied the responses, which were somewhat sophisticated: 8 agreed with Scientist Views; 2 with the Farmers View, and 11 with the Consumers. The majority agreed that long-term use of pesticides and herbicides on plants, whether sprayed on or genetically engineered, would be harmful risk for the consumer.

A graph was prepared based regarding the responses. The children were not only able to identify and compare numbers or recognize who had the most votes. They too noted that people don't always agree on the same issues. Sometimes we have to work together to make things happen. (They also agreed that the majority rules, and this time, consumers were the winners.)

## SECTION FOUR: SHOW WHAT WE KNOW

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Documenting student discoveries is a terrific assessment tool in determining student comprehension of subject matter. In addition to journal and independent writings by students throughout this unit, I recommend the group creation of Big Books at the conclusion of each section. Our class created two non-fiction Big Books entitled We Know About Digestion, documenting our classroom experiment and discoveries about the human digestive system, and Our Opinion Counts, based on viewpoints gathered during our Opinion Poll. The third book, written in rhymed verse entitled Do You Know, conveys student understanding of the foods we eat and their origins.

All students were encouraged to contribute to the work. Initially, their input was recorded in written form during 30-minute interactive writing and oral language sessions. During center and or free time, small teams of students (two to four children per team) had an opportunity to illustrate a page. Each book was completed within an approximate two-week span. 18" x 20" poster boards were used to create them. Final text was printed using a 60-pitch font, giving our work a professional quality.

Our children were pleased with the outcome of our studies, and their understanding of subject matter was evidenced in these completed works. Their Big Books are used during Sustained Silent Reading (SSR) and shared reading group sessions. They are housed in our classroom library, and the students eagerly and repeatedly read them whenever time permits.

## FINAL NOTES

The implementation of this unit proved rewarding for our young learners. Their enthusiasm and sophisticated responses encouraged me to feel confident that our young people have good heads on their shoulders, will be knowledgeable consumers, and will make sound decisions in the future.

My students requested that I include their literary work, DO YOU KNOW, in this curriculum unit. I agreed. (Know that at the completion our Food Classification Activity outlined in Section 1, we categorized over 70 different food products. My first graders came up with some interesting wording for our rhymed work. I had to assert that there was no way we were going to include every food we had listed; this book would have gone on forever. Nevertheless, it was a fun-filled experience.) You may find DO YOU KNOW useful to share with your young learners.

DO YOU KNOW?

by the Students of Room 10, Mrs. Mullins' Class

We learned a lot in this school year
About where foods come from
Come join us in our guessing game
We're sure you'll have great fun!
Beef burgers, hot dogs, sausage
Roast beefwe want some now
Do you know where these meats come from?
We do! They're from a cow.

Turkey baked and roasted
Chicken fried or stewed
Cornish hens and roasted duck
We eat meat from birds, do you?

Bacon, ham, spare ribs, and pork chops
Make our taste buds do a jig
Cold cuts, pork rind snacks and Jello
Tasty foods--gifts from a pig.

Tuna, salmon, porgies, whitings
Sardines, smelts, and flounder too
We'll eat snapper, we'll eat trout
All are fish, we know you knew!
Purple grapes and orange pumpkins
Cukes and melons ripe and fine
Zucchini squash ready for picking
Each of these plucked from a vine.

Orange yams and white potatoes
Crunchy radishes we've found
Beets and turnips, parsnips, carrots…

Tubers and roots beneath the ground.

Oranges, apples, pears and peaches,
Grapefruits, cherries all for me
Pecans, walnuts, acorns, chestnuts

Fruits and nuts all found on trees.

Milk and ice-cream, cheese and yogurt
Chocolate milk, delicious wow!
Pudding, sour cream, and butter
Gifts from our dear friend, the cow.

Over easy, sunny-sided
Boiled or scrambled on toasted bread
Whipped in milk blended with sugar
Tasty treats from a hen’s egg.

Cakes and bread, pretzels and popcorn
Crunchy rice cakes--salted or plain
Favorite cereals and granola bars
All food products made from grains.

We have learned where these foods come from
And we know there’re millions more
But one thing we know for certain
They don’t grow in the grocery store!

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