Action Science Through Agriculture

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Biotechnology at Work

Biotechnology allows scientists to look closer at genes and make improvements in them. Your body is composed of millions of individual units called cells. Within each cell are genes that carry all of the information that allows your body to work and determines how you look.

You get your genes from your parents. This is why you may look like your parents. All people, plants and animals inherit traits from their parents through their genes. One of the first people to study how traits are passed from parents to their young was a monk in Austria named Gregor Mendel. About 150 years ago, he used plants to show how certain things such as flower size and color are passed on from the parent to the offspring.

Biotechnology allows for scientists to study how plants grow and how they react to the environment. As a result, scientists can now insert a specific gene into a plant that will help it adapt to its environment, make it more pest resistant, or even make it more nutritious.

Used with permission from the Council for Biotechnology Information

What Does a Cell Do?

- The cell contains lots of things that help it work.
- The cell has a cover that lets some things in and keeps some things out.
- A **human cell** contains instructions that tell how to build humans. A **plant cell** contains instructions that tell how to build a plant. A bug cell contains instructions that tell how to make a bug.
- The cell has energy inside it.
- The cell has natural defenses that fight invaders such as bacteria.

Used with permission from Field of Genes from the National 4-H Council

Biotechnology and the Environment

Biotechnology can help farmers and the environment in many ways. Bugs and weeds are big problems for farmers. Farmers have many tools to choose from to protect their crops. Sometimes farmers use special chemicals to help control the weeds and bugs when they are really bad. Biotechnology is another option. For example, many farmers grow cotton. Some young insects, or larvae, love to eat cotton plants. To stop the larvae from feasting on cotton plants, scientists have found ways to use biotechnology to help the cotton plant protect itself from insect larvae worms. Farmers who grow these special cotton plants do not need to spray as much insecticide on their crops, and they can still grow as much or more cotton!

Weeds can be a problem for farmers too. Weeds crowd out farm crops and rob them of water, light, and nutrients they need to grow. Some farmers plow their fields to destroy these weeds, but plowing can cause soil erosion. Thanks to biotechnology, a farmer can manage the weeds without having to plow. This saves energy as well as the soil! Giving farmers more choices to control harmful bugs and weeds helps their farms and the environment.

Exploring Cells

Grade Level: 4-6 Science

Objective: Upon completion of this activity, students will identify parts of the animal and plant cells.

Illinois Learning Standards: Science 12.A.2a; 12.A.2b; 12.A.3a; 12.A.3b; 12.A.3c
Assessment: 12.4.05; 12.4.06; 12.7.02; 12.7.03,12.7.04; 12.7.05

Suggested Reading Materials:

IAITC Biotech Ag Mag
Gene Machines by Francis R. Balkwill
Enjoy Your Cells by Francis R. Balkwill

Introduction: This lesson was designed to help students learn the different organelles of the plant and animal cells. After students have been given the general introduction to the different organelles in each cell, have them explore the Biotech Ag Mag. Once they have read through the Biotech Ag Mag, have them complete the following activity.

Students are going to treat each individual cell as a theme park. Their goal is to create a theme park brochure with a map that will guide them through each cell organelle. The map should detail each of the organelles that you discussed in class and have an illustration and function of each. Students can choose between the animal or plant cell, or you could have them create a project for both.

The theme park maps can be placed on a brochure made from white paper plates. The instruction on how create the paper plate brochure are included in this lesson.

Vocabulary:

Cell wall: found only in plant cells and is for support and protection of the cell.
Cell membrane: found in both cells, controls material movement in and out of the cells.
Nucleus: found in both cells and controls cell activities.
Chloroplast: found only in plant cells and breaks down food into small parts.
Vacuole: found in both cells but is larger in the plant cell. Its purpose is to store food and waste.
Ribosome: found in both cells and produces proteins.
Mitochondrion: found in both cells and breaks down sugar into energy.

Exploring Cells Activity Sheet

Directions:

The goal of this exercise is to design a creative and colorful amusement park map. The animal cell or the plant cell will serve as your "amusement park." This brochure will provide visitors with a tour of the cell. Maps at amusement parks always explain the location of each attraction and what it does. Be sure to include this on your map! Each attraction in the map should come from the organelles that make up either the animal or plant cell.

Select from the animal or plant cell.

Make a list of the organelles found in your selected cell. Each organelle should serve as a stop on your amusement park map. On a scrap piece of paper, create a rough draft on how you want your brochure to appear.

Once you have designed your amusement park tour acquire the paper plates needed to create your brochure.

Paper Plate Booklet

Fold the first paper plate in half and cut a narrow window out of the folded edge. Start the window after the ruffled edge and end before the other ruffled edge.

Any additional pages should be folded and then reopened. On the fold, cut one slit starting from the edge of the plant and ending at the ruffle (cuts should be no longer than an inch). Make a second slit directly opposite the first one.

To assemble the booklet. Fold, but do not crease, the paper plate with the slits in half so that the two slits meet. With the plate folded in half, push the plate through the slit. Open the plate, moving one slit to the top of the window and one slit to the bottom of the window.

Close the brochure so all the plates are folded in half. Design the front cover to match your cell.

Use the inside pages to serve as the maps to the amusement park attractions.

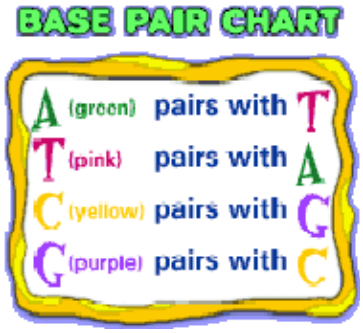
DNA Bracelet

Adapted from American Museum of Natural Historywww.amnh.org

Your bracelet will contain two strands of beads. The two strands will match up in the same way the bases in DNA, do: A always goes with T, and C always goes with G. So every time you put a bead on one strand, you must add its partner bead to the other strand.

The chart on the right will help you keep track. You can do both strands yourself, or you can string one side and have a friend string the other.

(We used green, pink, yellow, and purple beads. But you can use any four colors. And if beads aren't your style, try gumdrops.)



Cut two pieces of string, each about 12 inches long. (Remember, your bracelet will contain two strands, just like real DNA.)

Tie at least one knot about two inches from one end of each string. You may need to tie more than one knot so that the beads don't slip off.

Thread a bead onto String 1. Then thread the bead for the matching base onto String 2. For example, if you use a "C" on String 1, then you must put a "G" on String 2.

Keep threading beads until your bracelet is long enough to slip your hand through. (You do not have to use all the letters in the DNA code.)

DNA* is two strands twisted together in a double helix. Twist your two strands together so that the correct beads match up. If you want them to stay twisted, wrap a thread around the two strands.

Monarch butterfly *(Danaus plexippus)*
gaggctaccaagttcccgatatgtaggagatgcattgaaagatcgtttcg

Grizzly bear *(Ursus arctos)*
atgaccaaaatatcgcgaaaaacccaccattagctaaaatcatatcaaccaaatc

Sunflower *(Helianthus annuus)*
tgagagtgttagaaggtgccaaaatcaaatagggccccggagctgctaccaattg

Chimpanzee *(Pan troglodytes)*
tgaccccgaccaagccaaaattaaccccactaataaaattaattaatcaactca

Human *(Homo sapiens)*
tgaccccaataagccaaaattaaccccactaataaaattaattaaccgatcaa

African elephant *(Loxodonta africana)*
atgaccgaccattgcaaaatatcatcattcaactcaaaatgatgcaatcaaatc

Apple tree *(Malus domestica)*
gaattcggcacgagaagcacgatgcgagagagagagagagcaaaaatggtt

Red flour beetle *(Tribolium castaneum)*
ccaaaactcgggggatcgccttcgccatactatgcctggccgagaatcccca

Brown trout *(Salmo trutta)*
attggctaactattaggatgtgtatagccaccaaattattaccggac

SEED GERMINATION

5 E's	Suggested Activity
Engage Encounter The Topic	Read the Soybean Ag Mag. Read Oh Say Can You Seed? by Bonnie Worth. Read p.6-12 in Raymond Bial's The Super Soybean. Complete the Bean Book activity. Watch seed germination clip available at: www.ncsu.edu/project/agronauts/mission2_4.htm. Visual aids (posters) See the Beanie Baby activity without explanation.
Explore Active Involvement	Develop hypothesis of seed germination. Conduct Beanie Baby Activity. Record observations. Test prediction of seed germination. Find percentage of seed germination.
Explain Communicate Discoveries	Analyze findings. Draw conclusions about seed germination. Develop definition of seed germination. Compare findings with other classmates.
Extend Make Connections and Apply Understanding	Modify Beanie Baby experiment by changing variables (temperature, water, light, seeds, media, etc.). Record findings. Compare findings with those of the control group. Find percentage of seed germination from experimental group and compare to control group. Draw conclusions about seed germination. Explain findings.
Evaluate Assess Understanding	Explain seed germination using research and data from experiments by answering questions (ie. How would you explain seed germination? Why do you think your control experiment had a higher percentage of seed germination than your experimental group?). Make seed germination visual aid/model. Organize findings into a final lab report.

5 E's	What the Teacher Does
In Advance Prepare Materials for the Lesson	Three days in advance, prepare a Beanie Baby. Gather materials for Beanie Baby Activity: soybeans, Soil Moist, small Ziploc bags, and yarn. Also gather possible materials for students who may want to alter media, seeds, temperature, and light during the Extend stage. Photocopy the soybean worksheets.
Engage Encounter The Topic	Provide students with different ways to explore the topic of seed germination. Allow students to select their own approach. Float between students and ask questions as they learn more about seed germination. Introduce the concept of germination. Show students germinating soybeans. As a class, record observations of the germinating soybeans. Ask them: What causes a seed to germinate? Explain that it will be their job to discover the answer. Show students the Beanie Baby activity. Explain the steps involved, but *do not provide an explanation about seed germination*.
Explore Active Involvement	Divide students into groups of three. Each student in the group should complete the Beanie Baby activity. This will provide them with a larger control group. Prompt students to write a hypothesis about seed germination by asking questions such as: What prediction can you make about what causes a seed to germinate? How can you write that in an if/then statement? Is this statement testable? How could you test it? Provide suggestions or guidance as students conduct the Beanie Baby activity. Read through students' observations as they record them. Encourage them to use specific, detailed descriptions. Help students how to calculate the percentage of seed germination. *They will need to count how many seeds germinated and then divide this amount by the total amount of seeds.*
Explain Communicate Discoveries	Help students summarize conclusions about the Beanie Baby activity by asking guiding questions such as: What did you learn about seed germination? How do you know? What evidence from your observations can you use to support your conclusion? Allow students to share their definitions of seed germination.
Extend Make Connections and Apply Understanding	Before students design their experiments, discuss control groups and experimental groups. *Control group: The experiment is done as is. No variables are changed .* *Experimental group: One variable is changed in the experiment to see what happens.* Ask students: What is the purpose of a control group? What is the purpose of the experimental group? Explain that the Beanie Baby activity is the control group and that the students will develop the experimental group. Encourage them to list the variables that could be changed. Have students share their ideas as a class. Approve the students' experimental designs. Offer any suggestions or feedback. Help students compare the results from the control group to the experimental group. Ask: What do you already know about seed germination? Did you learn anything new about seed germination from the experimental group? If so, what?
Evaluate Assess Understanding	*Choose any of the following for an assessment:* Have students explain seed germination using research and data from experiments by answering questions: How would you explain seed germination? Why do you think your control experiment had a higher percentage of seed germination than your experimental group? Make a seed germination visual display/visual model. Organize findings into a final lab report.

Hypothesis:

Procedure

Step 1: Place a 1/2 teaspoon of Crystal Soil into the bag.
Step 2: Add one tablespoon of water.
Step 3: Gently push in three soybeans.
Step 4: Seal your bag.
Step 5: Punch a hole in the top your bag, above the zipper seal. Insert the yarn to make a necklace.
Step 6: Use the yarn to hang the Beanie Baby in the room or wear it around your neck.
Step 7: Check your Beanie Baby several times a day to watch the process of germination. Your observations will occur over the course of three days. Your group needs to select time intervals to observe the germination (every half hour, every hour, etc).
Step 8: Record observations and chart growth. It may be helpful to draw pictures of each stage on a separate sheet of paper.

Time and Day of Observation	Observations

Time and Day of Observation	Observations

Briefly summarize the results of this experiment. Include the percent of seeds that germinated.

What conclusions can you make about seed germination?

Write your own definition of seed germination.

What variables could be changed in the Beanie Baby activity?

In your lab notebook, design an experiment changing one of these variables. Include the following in your experimental design:

Hypothesis: Develop a hypothesis. Make a prediction about how altering the variable will effect seed germination. Also, predict how many soybeans will germinate in the experimental group.

Procedure: List the steps from start to finish. Explain things in detail so that someone else could easily do your experiment.

A list of materials needed to complete the experiment.

Develop a way to record your findings (chart, journal log, etc).

After your group's design has been approved, conduct your experiment. During your experiment, make notes on anything that should be altered from the original design.

In the box below, briefly summarize the results of your experiment. Find the percent of seeds that germinated.

CONTROL VS. EXPERIMENTAL GROUP

Compare the percent of seed germination from the control group to that of the experimental group. Describe your findings.

What conclusions can you make about seed germination?

History of Agriculture and Technology

Grade Level: High School

Approximate Length of Activity: Three class periods

Objectives:

Teacher:

1. Introduce agriculture events in United States history.
2. Help students understand agriculture's importance and the events that have changed ideas and principles used in today's society.

Students:

1. Identify important agricultural developments that occurred in early American history.
2. Explain the major technological developments that have occurred in agriculture.

Illinois Learning Standards: 4.B.3a; 4.B.3b; 4.B.3c; 4.B.3d; 4.B.4a; 4.B.4b; 4.B.4c; 4.B.4d; 5.A.4a; 5.B.4a; 5.A.3a; 5.B.3a; 13.B.3a; 13.B.3c; 15.D.3c; 16.D.4w.

Introduction:

Agriculture has been an integral part in the history of the United States. Without people to work the land and grow the food, the world would not exist. Today, agriculture is still the center of the economy.

Farmers do a lot to prepare the soil for planting and to care to the crop and harvest. In earlier times, farmers had to do most of the jobs by hand with very few tools to help them. Farmers used animals to do most of the heavy work. Farms have gone from using very few hand tools before the 1700s to using different types of machinery and equipment. The Agricultural Revolution began in the early 1700s. During this time, many discoveries and inventions have been made. This helped make farming easier and much more productive. Inventions allowed one farmer to produce more food and feed more people than previously. This lesson will help students become more aware of the numerous milestones in agricultural history. These milestones have helped shape our nation into one of the leading agricultural countries in the world.

Materials Needed:

-History of Agriculture handout
-Computers for research with Internet connection
-Paper

-LCD projector and laptop
-Writing utensils
-Poster board
-Scissors, glue sticks, tape, markers
-Agricultural magazines

Activity Outline:

Prior to lesson – have students conduct a **survey** throughout the school. Have them ask **three** individuals what is the first thing they think of when agriculture is mentioned. Chances are that most people think of farming when agriculture is mentioned. Use the survey results as a basis for a discussion on how far-reaching agriculture is. Why do people perceive that agriculture is just farming? Use the discussion as a starting point in helping the class to understand that agriculture is far more than farming. It is a high-tech industry that is responsible for a large number of jobs throughout the world. Then ask students if they know of any events in history that may have changed the way that people look at agriculture.

1. Start the PowerPoint presentation entitled: "History of Agriculture" on the laptop and LCD projector. Have students take notes on the following:

   PowerPoint Presentation Notes:

   What important early developments in agriculture helped influence life today?

   Early agriculture in what became the United States was influenced by two groups of people.

   A. Native Americans included Indians, Hawaiians, and Eskimos. The early agriculture of these people consisted mainly of hunting and gathering to meet their food, clothing, and shelter needs.
      1. Around 7000 B.C. Indians began simple farming.
      2. By 1000 A.D. corn was grown in large plots.

   B. Colonists were mostly people from Europe who came to America to help settle the new land. They learned successful agriculture practices from the Native Americans.
      1. In 1611, a shipment of livestock arrived in the colony of Jamestown, Virginia. This shipment became the foundation for livestock production in colonies of the southeast.
      2. The colonists brought about the domestication of animals. ***Domestication*** refers to the taming, confinement, and breeding of animals for human use.

   What have been the major technological developments in agriculture?

There have been many important technological developments in agriculture throughout history. These developments have drastically changed the agriculture industry.

A. In the mid 1700s, 90% of the people were farmers. Because of technology, now only 2% of the American population is engaged in production agriculture. ***Technology*** is the use of inventions in working and living. An ***invention*** is any new device or product or a new way of doing work.

B. Important technological advancements in American agriculture between 1607 and 1901 include:
    1. 1607 – The Indians show the Plymouth Colonists how to grow crops such as corn, pumpkins, squash, and beans.
    2. 1700s – Charles Townshend develops the first crop rotation systems.
    3. 1700s – Jethro Tull develops a planting machine.
    4. 1793 – The cotton gin is invented by Eli Whitney.
    5. 1834 – Cyrus McCormick invents the reaper.
    6. 1837 – John Deere designs a one-piece wrought iron plow in Grand Detour, Illinois.
    7. 1800s – Gregor Mendel, a botanist, discovers the basic principles of heredity.
    8. 1850 – Joseph Glidden develops barbed wire for use by cattle ranchers.
    9. 1862 – The Morrill Act creates land-grant universities. The USDA is established.
    10. 1869 – Transcontinental railroad is completed.
    11. 1901 – First successful gasoline engine tractor is built.

C. Important advancements in the 20th century include:
    1. Improved varieties of corn were developed. These varieties were more resistant to pests and diseases.
    2. The development of new chemicals to control insects, diseases, and weeds.
    3. Genetic engineering and other advanced methods of improving crops and livestock were implemented.
    4. Computers were developed and began to be widely used in agriculture.
    5. ***Biotechnology***, the science to change organisms or their environment or to get products from organisms, began to be used.

2. Tell students that this is just a broad overview of some of the important events in agricultural history of the United States. Distribute the "History of Agriculture" handout. This will give students a better look at more agricultural events that have shaped our nation's history.

3. Next, divide the students into groups of four.

4. Assign each group 100 years of United States history. With the poster board and materials, the students are then to make their own timeline of significant events in agricultural history of the US.
   A. The students are to cut the poster board in half. They may use any materials necessary to put the timeline together.
   B. It is recommended that students use pictures and any other artifacts related to the subject to complete this activity.
   C. To make this activity run more smoothly, it is recommended that two students do the research while the other two put the timeline together.
   D. Have the students doing research visit the Web site www.usda.gov and go to USDA kids. This is an excellent resource for information.
   E. Make sure each timeline mentions information such as inventions (technology), number and size of farms, land availability, the economy, and population.

5. As soon as the timeline is complete, let each group present it in front of the class. Let them explain why they chose those events and how it has shaped our nation's history.

Discussion Questions:

1. Is agricultural technology good for society?
2. What did the colonists face when coming to the United States?
3. Why were granges formed? What was their purpose?
4. Which advancement or new technology has had the greatest impact on society?
5. Is agriculture experiencing a polarization of its population? Is it becoming small farm vs. large farm? What might be a problem of corporate farms?
6. Can production agriculture survive the threat of urban sprawl?
7. Will a continued and expanded use of cloning and GMOs improve American agriculture's ability to compete in a world market?

Related Activities:

1. Have students write a report on one of the events mentioned in the lesson.
2. Create a debate on current event topics involved in the agricultural industry.
3. Bring in a retired farmer to discuss farming when he/she was growing up and the changes they have seen.

Other Resources:

www.usda.gov

Herren, Ray. *Exploring Agriscience*. Albany New York: Delmar Publishers, 1997.

Morgan, Elizabeth, et. al. *AgriScience Explorations*. Danville, Illinois: Interstate Publishers, Inc., 1998. (Textbook, Chapter 1)

Drache, Hiram M. *History of U.S. Agriculture and Its Relevance to Today*. Danville, Illinois: Interstate Publishers, Inc., 1996. (Units I-V)

Illinois CORE curriculum CD. Illinois State Board of Education

The History of Agriculture

1492 – Columbus discovered America
1525 – Spanish introduced cattle
1609 – First corn grown
– Captain John Smith bought to establish Jamestown
1611 – First wheat planted
1612 – First tobacco planted
1619 – Blacks and immigrants arrived as indentured persons – work off transportation costs and learn customs – after 1640 it was for life
1646 – Scythe invented
1660 – Pork was cured and packed for export
1700 – Soil infertility first means to rectify was fish, city manure, and clover
1765 – Average farm size was 135 acres
1775 – 1783 – American Revolution
1784 – Massachusetts posed ordinance to be lawful to cut white pine over 24" in diameter
1785 – Land Ordinance of 1785 – no restriction on land sales – large blocks were sold for $1.00/acre
1786 – Land Act of 1786 – minimum price of $2.00/acre – minimum tract 640 acres paid in one year
1790 – First paved highway Lancaster, NY to Philadelphia
1792 – First formal instruction in agriculture at Columbia University
1793 – Cotton gin invented
1800 – Land Act of 1800 – mini tract 320 acres, four annual payments at 6% interest
– One ton of goods cost $9.00 from US to Europe
– One ton of goods cost $9.00 30 miles overland
1803 – Louisiana Purchase for $15,000,000 from France – Mississippi River to Rocky Mountains and from Canada to Gulf
1804 – Land Act – Eliminated interest and mini 160 acres tract
1810 – First livestock show in Massachusetts
1813 – John Lorain demonstrated non-manure corn = 15 bushels and manure corn = 90 + 100 bushels
– 26,880 population yielded 118 bushels suggested 20,000 population
1814 – One ton of goods cost $32.00 100 miles overland
– It took 100 days at $100.00 to float goods from Cincinnati to New Orleans
1819 – Farm journals and food cannery
1820 – 87% of the jobs were farm laborers 1870 – 47.5% 1944 – 1.5%
1825 – First year for a standing committee on agriculture – Erie Canal built
1830 – 192 minutes to produce a bushel of wheat, 1896 = 8.9 minutes
18931 – McCormick reaper invented
1837 – John Deere plows built – two bottom, 5.5 acres a day, 1864 added the seat
1839 – The Patent Office requested $1,000.00 for collecting data on plants and seeds.
1840 – Development of canals which enabled Ohio to be the wheat leader
1846 – Gail Borden preserved milk in powered milk
1849 – Transfer from Patent Office to Department of Interior

1850 – First paved highway reached the Mississippi River
– 58% of disposable income spent on food
1854 – Frist windmill 200,000 by 1880, 400,000 by 1890, one million by 1920
– Done away with small gas engines
1855 – 1274 minutes to produce a bushel of corn, 1894 = 41 minutes
1858 – Mason jars
1859 – First milk inspector – Boston, 1864 – prohibited milk from diseased cows
1860 – 1900, 407 million acres to 839 million acres
– 3566 steamboats disappeared through introduction of railroads – still more expensive than boats
– 992,310 hogs slaughtered – 1880 = 11,001,689 – 1900 = 28,742,551
– Commercial floriculture and horticulture – vegetable and flower production heated water as a source of heat
1861 – 1865, Civil War
1862 – Founded Department of Agriculture
– Lincoln disease research
– Homestead Act, 21 or over = 80 to 160 acre plots - $10.00 filing fee, $4.00 commission fee, $4.00 final proof
– Morrill Act – established land grant college
1865 – Chicago stockyards had established local inspectors
1870 – Urban markets took 40% of farm production
1874 – Barbed wire
1877 – First hybrid corn, 1905 = first big drive for hybrid corn
– Swift shipped first dressed beet east through first refrigerated boxcars
1880 – 100 A & P stores (Atlantic & Pacific Tea Company)
1887 – Hatch Act established experiment stations
1890 – 42,544 people employed in farm machinery, 910 plants
– Second Morrill Act, separate but equal
– Meat inspection – federal law
1891 – Gas powered tractor – Waterloo Company, which became JD (John Deere)
1896 – Rural free delivery
1899 – Engine on truck – International Harvester
1900 – 200 A & P stores
1900 – Weather Bureau started broadcasting via telegraph
1906 – First tractor school in St. Paul, MN
1907 – Hog cholera serum
1910 – 27% of crop production was used to feed work animals
1912 – Four wheel-drive (did not become popular until 1950) and four wheel-steering
1914 – Smith-Lever Act – extension service
1914 – 1918-World War I "Food will win the War," wheat acres increased 42%, prices increased 3 times
1915 – 25,000 tractors
1916 – Federal Farm Loan Act
1916 – Piggly Wiggly opened first self-service grocery store
1917 – Planted 22 million acres more than 1916 and 6 million more in 1918

1919 – Census showed grade school was 1.5 miles away, church 2.9 miles, market 4.8 miles, doctor 5.7 miles, high school 5.9 miles, hospital 13.9 miles
1920 – Crops were 48% less than 1919
1920 – 39% of farms had telephones
– 30% of farms had automobiles
1920 – Land was 5 times the price as in 1900 which led to the depression
1921 – Farm Block organized (Coops)
1921 – First radio broadcast of a weather report from University of Wisconsin
1921 – Airplanes were used for crop dusting
1922 – First radio market report from Iowa State
1924 – First all-purpose tractor marketed
1925 – 500,000 tractors
1926 – Commercial hybrid seed corn sold
1927 – 1 worker and 1 tractor could work 250 acres of corn, while one worker with horse power could only do 40 acres
1929 – Airplanes were used to seed rice
1929 – Wheat per bu $1.03 to .36 in 1930
1930 – First sprinkler systems used in Pacific Northwest
1933 – Soil Conservation Service established
1935 – Rural Electrification Administration
1939 – DDT formulated arrived in US in 1943 banned 1972
1939 – First self-propelled combine Massey-Ferguson
1939 – 1945 – World War II
1940s – Commercial fertilizer became apparent in all parts of the US – fertilizer boxes put on planters in 1929
1944 – 1/3 of radio stations had a farm report
1946 – 300 bu contest began by Farm Journal
– 1947 had 5 contestants @ 115 bu
– 1948 had a top yield of 224 bu
– 1955 had a top yield of 304.39 bu @ 14%
– 1975 record broken by IL farmer @ 338 bu
1947 – General Agreement on Tariffs & Trade (GATT)
1950 – 2,4-D was marketed
1951 – Reasons for not mechanizing
– too old
– unable to finance
– couldn't justify (too small)
– preferred working w/animals
– unable to get skilled labor to run machines
1955 – Tractors overtook the number of horses.
1956 – Soil Bank – 1st effort to reduce production – 1st 10 year program to help people get out of farming
1956 – Food stamp program – food for disadvantaged
1957 – Four wheel tractors marketed
1960s – Chemicals and fertilizer exploded into crop production

1960 – The top 3% (1200) of farms produced as much as the bottom 78% (1.6 mil) of farms
1962 – Horses no longer counted on ag surveys
1975 – 1st cow to produce 50,000 lbs of milk (tank truck)
1977 – A 35 row corn planter was marketed (11 acres in 10 minutes)
1978 – 50.3 million acres were irrigated from 3.6 million in 1889
1985 – USDA involved in bio-technology
1985 – CRP Conservation Reserve Program
1985 – BST produced & approved for use in 1993
1993 – NAFTA North America Free Trade Agreement
1993 – GPS Global Positioning System

Digesting the World's Diet

Grade Level: 4-6

Objective: After completing this activity, students will have explored the nutritional habit of families all around. Students will be able to compare and contrast these countries with the United States and each other. They will also be able to investigate how weather, landscape and soil types affect agriculture all around the world.

Illinois Learning Standards: 3.A.2; 3.B.2b; 3.C.2a; 4.B.2a; 5.A.2b; 5.C.2b; 15.A.2a; 17.A.2a; 23.C.2a; 23.C.3
Assessment Standards: 3.5.03; 3.5.06; 3.5.19; 3.5.28

Suggested Reading Materials:
Hungry Planet: What The World Eats by Peter Menzel & Faith D'Aluisio
ISBN-10: 1580088694

Activity Instructions:
Discuss the book, Hungry Planet: What The World Eats.
Have the students pick one of the countries in the book (any country but the United States). Give the students a photocopy of the picture of their country from the book and the introductory page of each country which includes the cost of all their food purchased for one week.
Students should investigate the country using the internet, books, encyclopedias, etc.
Have the students write a report on their country including what items were purchased and how much money was spent. Have them include agricultural aspects such as weather/climate, topography/landscape, soil types, etc. Each student should use these findings in their discussion of why the people of their assigned country can grow specific foods and why they can't grow other types of food. Students should also discuss nutritional aspects. Does the food purchased fulfill all of the nutritional needs of the people in that country?
After writing their report, have the students prepare a short presentation about their country. This could be done with a PowerPoint presentation or just a general sharing session.
After all students have shared their findings, discuss how the United States differs from other countries. What kind of land and climate do we have? What types of food do we buy? How much money do American families spend on food?

Lesson Extender:
Combine this lesson with the "Perfect Proportions" lesson. Talk about what the students eat for one week compared to their assigned countries. This could even be included in their reports.

A Slice of Soil

Soil is one of our most important natural resources on the earth's surface. Many living things depend on it for food. People do too. Not all soil is good enough for plants to grow. Complete this activity to learn just how little soil we have to grow food.

An apple and paring knife are needed for this activity:

1. Cut an apple into four equal parts. Three parts represent the oceans of the world. The fourth part represents the land area.

2. Cut the land section in half lengthwise. Now you have two 1/8 pieces. One section represents land such as deserts, swamps, antarctic, arctic, and mountain regions. The other 1/8 section represents land where man can live and may or may not be able to grow food.

3. Slice this 1/8 section crosswise into four equal parts. Three of these 1/32 sections represent the areas of the world that are too rocky, too wet, too hot, or where soils are too poor to grow food. Plus, we can't grow food on some land because cities and other man-made structures are built on it.

4. Carefully peel the last 1/32 section. The peel on this small piece represents the amount of soil on which we have to grow food. This amount of soil will never get any bigger.