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IDEAS

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2009-2010

20 Years of IMPACT II Teaching Ideas

Idea Packet

Hoe! Hoe! Hoe!

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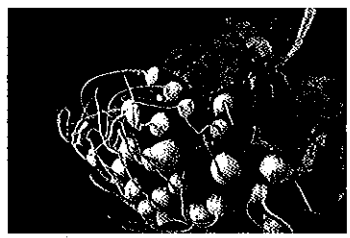
Hoe! Hoe! Hoe!

Florida Ag in the Classroom



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GOAL

Students discovered that the food on their tables began in a garden and/or on a farm. The food goes through many changes before it gets to Winn Dixie, Publix, or the corner store, and finally gets to their tables. We developed classroom instructional materials integrating state sunshine standards and agricultural concepts. We promoted a strong partnership between the agricultural community and the students with the purchase of vegetables and fruit from the Farmers market.

OBJECTIVES

1. Identify appropriate grade level vocabulary words that will be placed on chart paper for teaching/learning purposes.
2. Point to each word that was part of the seed and plants and identified vocabulary words.
3. Read books pertaining to gardening and a variety of planting techniques.
4. The children will prepare the ground for planting.
5. A brief study on the kinds of soil and plants that can be planted in Florida.

SUNSHINE STATE STANDARDS

Science:	SC.G1.24	C.G.1.23	SC.F.F1.15
	SC.G.2.2.1	SC.A.1.2.4	SC.H.3.2.1
	SC.G1.22	SC.E.1.2.1	SC.H.3.2.4
	SC.G.1.2.4	SC.F.2.2.1	SC.F.1.2.3
	SC.G.1.2.6	SS.B.1.2.5	

EVALUATIONS

1. The teacher will present students with pre and post tests with FCAT style questions.
2. The teacher will create opportunities for awareness, critical thinking, and skills development.
3. The teacher will teach and expose the students to agricultural literacy from an assortment of fictional and non-fictional reading materials.

Course Outline/Overview

Project Title — Hoe! Hoe! Hoe!

Brief Description — In bringing agriculture to the classroom, urban students will discover the source of the food they eat. They will study plants and their growth and food production and distribution. In the process of creating and caring for a garden, students will also discover that math and science are useful in their daily lives. The science/math based repetitive activities that are inherent to an outdoor garden lab helps students to internalize and apply the Sunshine State Standards creatively.

In addition to the measurements, graphs, charts and science activities the project generates, it also is a springboard to participating in the annual county Youth Fair. Besides the categories of garden specimens and food production, the garden provided the inspiration for student's photography, entomology, public speaking and arts & crafts entries. The Fair gives urban youth the opportunity to showcase their best work while it brings agriculture and the farm experience into full view for urban students of all ages.

Impact of Project — Students have improved daily attendance because they are anxious to see growth and record results on charts. They also have drawn examples of growth beginning with the planting of seeds, then observing sprouts, and recording daily growth. They have more respect for the school grounds in general, but specifically admonish others to respect their garden.

Tomatoes to Ketchup, Chickens to Omelettes

LEVEL: Grades PreK-6
SUBJECTS: Language Arts, Science, Social Studies, Consumer Education
SKILLS: Analyzing, brainstorming, classifying, collaborating, collecting, constructing media, cooperating, developing vocabulary, discussing, evaluating, identifying, matching, performing, sorting, synthesizing

MATERIALS
Scissors, glue, large pieces of paper for collages; magazines, weekly newspaper food ads, Sunday newspaper coupon supplements; ***Food Products*** and photocopies of the attached ***Raw Food Pictures*** sheets.

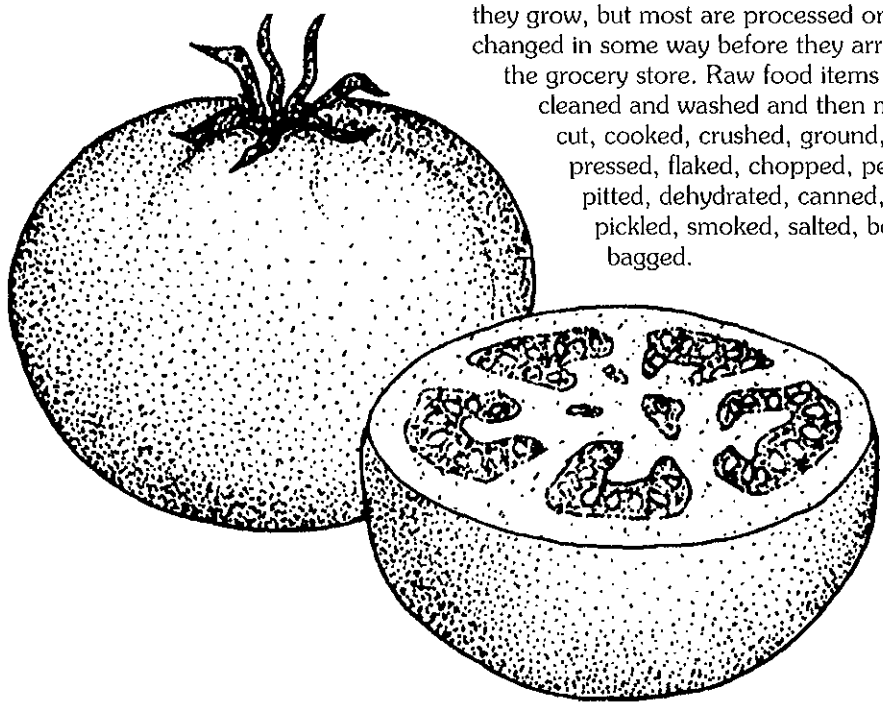
VOCABULARY
crush, dehydrated, flaked, ground, pitted, pressed, processed, product, raw, salted, smoked

RELATED LESSONS
Nail by Nail, Board by Board
From Fiber to Fashion
Step by Step
What Piece of the Pie?

SUPPORTING INFORMATION
The farmer and rancher are only the first step of the huge agricultural industry. Although farmers' markets are becoming more common across the country, relatively few farm products are sold by the producer directly to the consumer. Many agricultural jobs link the producer to the consumer. After the food is harvested or picked, truck drivers transport food to a market or a processing plant. Other jobs include packaging, distributing, advertising, and selling the food products. Agriculture-related occupations involve more than 17 percent of the national workforce.

Food production begins on a farm or ranch. Butter is made from milk from dairy cows, and steak comes from beef cattle. Flour comes from ground wheat. Potato chips and french fries are made from potatoes grown on a farm. In some cases, different forms of a product can produce different kinds of food. Beef cattle, for example, are used for their meat, whereas dairy cows are used primarily for dairy products.

Some food products come to you just the way they grow, but most are processed or changed in some way before they arrive at the grocery store. Raw food items are cleaned and washed and then may be cut, cooked, crushed, ground, pressed, flaked, chopped, peeled, pitted, dehydrated, canned, frozen, pickled, smoked, salted, bottled, or bagged.



BRIEF DESCRIPTION
Students build connections between raw and processed food items by cutting out pictures, matching pictures, and making collages.

OBJECTIVES
(Note: All three objectives are appropriate for older students; younger students may accomplish only the first two objectives.)
The student will:
- sort food pictures according to raw food source;
- create a collage that illustrates a specific raw food and its products; and
- analyze the processes raw foods undergo when processed.

ESTIMATED TEACHING TIME
Three sessions: 45 to 60 minutes each.

GETTING STARTED

Collect enough magazines and newspapers with food pictures, food ads, and food coupon supplements for each student to cut out at least five pictures. Students can collect empty food containers and food labels related to the ***Food Products*** sheet. Gather scissors, 15 or more large pieces of paper, and glue for group collages. Photocopy and cut apart the ***Raw Food Pictures*** sheets. To model the sorting process in Session One, Step 4, cut out at least five pictures of foods you eat. **Optional**: Write a letter to parents explaining the project and asking them to help students gather pictures and/or empty, clean food containers and labels.

PROCEDURE

SESSION ONE

1. Brainstorm with students about the foods they eat and write their verbalized food items in a visible place. Continue until the list is fairly lengthy and includes many of the items from the ***Food Products*** sheet. Add some of your favorites.

   Options for younger students
   Begin the session by visiting a grocery store. Have a store employee show students examples of raw foods and some of their food products. Or read a book such as *From Wheat to Pasta* by Robert Egan (Children's Press, 1997) and begin with a discussion about raw foods and processed foods.

2. Distribute magazines, food ads, and coupon supplements to students. Show them the pictures you cut out. In pairs or alone, have them cut out pictures of food items they eat. (Note: Ketchup, catsup, and catchup are used interchangeably on different brand names.)

3. Place the raw food pictures around the room and ask students to identify the pictures. *(apple, beef animal, chicken, chicken eggs, corn, dairy cow, grapes, hog, oranges, peanuts, potatoes, rice, soybeans, tomatoes, wheat)*

4. Tell students they will be sorting and matching their food pictures, with the raw food pictures, based on what the foods were made from. (Some of their food pictures are not going to match any of the 15 raw food pictures. That's okay! They can put them with the "Other" card for Extension 2.)

   Using your pictures of food you eat, model the process. Walk around the room matching your food pictures with the appropriate raw food picture. Place your food pictures around the raw food picture.

5. Have students match their pictures with the raw food pictures or put them in the "Other" pile. Some processed foods may contain more than one raw food. Have students group those foods by the dominant raw food. If food labels are used, older students can examine the ingredients to match processed foods with the raw food. The ingredients will be listed in descending order by weight. Older students can create Venn diagrams for processed foods made from more than one raw food. (For information see the ***Venn Diagram #1*** and ***#2*** located in the Appendixes.) Collect all the pictures for each raw food picture for Session Two.

SESSION TWO

1. Divide students into pairs. Give each pair all the pictures for one raw food to evaluate the accuracy of the matching. Tell students their job is to decide if all the food pictures belong with their raw food picture. If the food in the picture was not made at all from the raw food, have groups find the appropriate match or place pictures in the "Other" pile.

2. Once groups have determined that all the processed foods match their raw food, have them create a collage. Students arrange the processed food items around the raw food or create their own design. Older students may find additional pictures of processed foods.

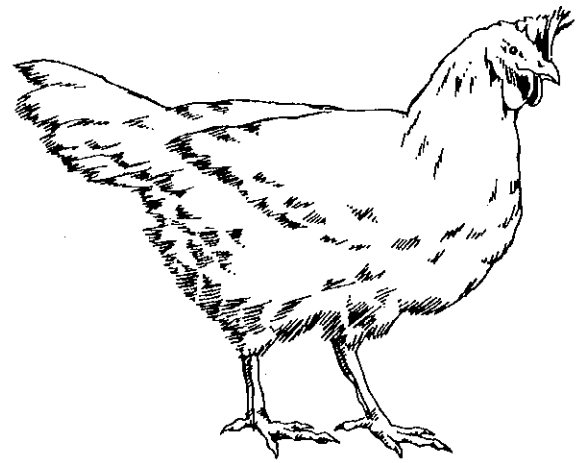
3. Have each group present its collage to the class. Ask, "Which processed food items around a raw food product surprised you? Why?"

SESSION THREE

1. Write in a visible place the following steps or changes a raw food item goes through before becoming a processed food product. Some possible steps include:

   - growing
   - picking or harvesting
   - transporting
   - processing (raw food items are cleaned and washed and then may be cut, cooked, crushed, ground, pressed, flaked, chopped, peeled, pitted, dehydrated, canned, frozen, pickled, smoked, salted, bottled, or bagged; other ingredients may be added)
   - packaging
   - distributing
   - advertising
   - retailing (grocery store)
   - purchasing and consuming

   The steps vary based on the processed product.



Using one of the collages, identify the possible steps on the list that the raw food underwent. In groups, have students select three processed foods from their collages. Tell them to list all the steps the raw food product went through from the field to the grocery store. Have them prepare a skit to present to the class in which they act out the steps.

2. To summarize, ask:

   - Which raw food item had the most processed food pictures? Why? (Make sure students consider whether it's the appeal of the processed food or if it's the diversity of product.)

   - How else do you or your family process corn, apples, chicken, and other items from the raw foods list?

   - What are some other processed food products that could be invented from a raw food? What steps would they undergo in processing? (Also see Extensions and Variations 3.)

   - What did you learn about where processed foods come from?

3. **Optional**: Change a raw food product into one of its processed forms. For instance, whipped cream and butter can be made from heavy cream. Pour one cup of heavy cream into a bowl. Using a wire whisk, beat cream to add air until whipped cream is formed. Continue beating to make butter. Students can spread their butter on crackers to taste it. Commercial butter does taste different since it contains ingredients in addition to cream.

   You can also change popcorn kernels into white pieces of popcorn and peanuts into peanut butter. Pop popcorn kernels in a popcorn popper or microwave for edible pieces of popcorn. Place whole peanuts in a blender and whip until chunky or smooth for peanut butter.

EVALUATION OPTIONS

1. Students correctly match a set of processed food pictures or names with particular raw foods.

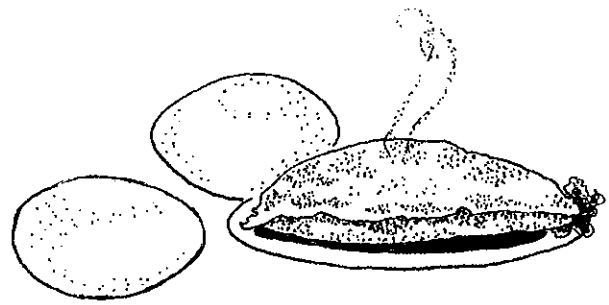
2. Students choose a raw food product, draw it on paper, and surround it with drawings or pictures of its processed products.

3. Students draw and label all the steps involved in changing a raw food to a specific processed food.

4. Have students name two foods they eat that come from tomatoes, wheat, chickens, peanuts, dairy cows, and so on.

EXTENSIONS AND VARIATIONS

1. Have small groups of students decide where their foods belong on the ***Food Guide Pyramid***. (See the ***Food Guide Pyramid*** located in the Appendixes.) The fats, oils and sweets on the top layer of the pyramid come from food products such as butter, margarine, maple syrup, sugar beets, sugarcane, canola oil, coconut oil, corn oil, olive



   oil, peanut oil, and soybean oil. (To learn about food groups and nutrition see the FLP lesson "What's the Shape of Your Diet?")

2. Have students sort all the food pictures in the "Other" pile according to their raw food sources. Encourage students to discuss the diversity of foods they enjoy and the food sources or find additional pictures and make collages.

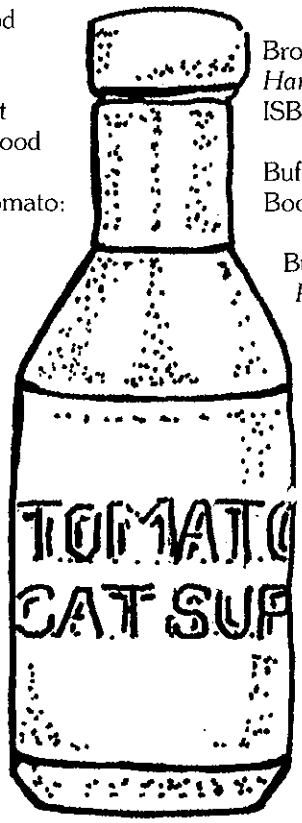
3. Farmers are always looking for new products that will create more sales for the raw food items they produce. (This is called value-added.) Challenge students to imagine a new product that can be processed from a raw food. Have them name their new product and its source, describe the processing steps, design the packaging to sell it, decide where to sell it, identify who would buy it and why, design advertising, and price it. (For additional information

about the steps and careers involved in changing a raw food to a processed food see the FLP lesson "Step by Step.")

4. Have students interview older people in the community to learn about food before such things as microwave foods and fast-food restaurants.

5. Hold a food fair. Ask students to collect processed foods from a common raw food product. Sample the variety of foods collected. For example, from a fresh tomato: ketchup, pizza sauce, salsa, stewed tomatoes, sun-dried tomatoes, tomato juice, tomato paste, tomato sauce, tomato soup, and more.

6. Have students go to a grocery store to research how many brand names and forms they can find for one processed product. Orange juice is a good example. Discuss with students why they think there are so many different brand names and forms for one processed product. Ask, "What are the differences between the various brands of juice?" *(price; size of product; form - frozen, concentrate, ready to drink, powdered; where grown and processed)*



7. Invite a guest speaker from a food-processing plant in your area or arrange a field trip to the plant. Ask the person to be prepared to discuss energy costs involved in transporting, processing and distributing food items.

8. Have the students visit the Web sites listed in the Resources section to see how either orange juice, chocolate or sugar is processed from raw products.

9. Have students analyze the school lunch. Have them list the raw foods and determine the kinds of processing the food underwent. Older students can graph the number of processed foods for each raw food.

10. Explore food processes such as dehydrating (e.g., raisins, jerky), canning and freezing. Older students might explore how different raw foods are processed to make food for animals. What are the similarities and differences with food processed for people?

ADDITIONAL RESOURCES

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DePaola, Tomie. *Tony's Bread: An Italian Folktale*. Paper Star. Reprint Edition 1996. ISBN: 0698113713.

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Fowler, Allan. *If It Weren't For Farmers (Rookie Read About Science)*. Children's Press. 1994. ISBN: 0516460099.

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Julius, Jennifer. *I like Potatoes (Good Food).* Children's Press. 2001. ISBN: 051623059X.

Kalman, Bobbie. *Hooray For Dairy Farming!* Crabtree Publishing. 1997. ISBN: 0865056641.

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Landau, Elaine. *Tomatoes.* Children's Press. 1999. ISBN: 0516210289.

Lillegard, Dee. *Potatoes On Tuesday (Let Me Read Level 1).* Goodyear Publishing Company. 1995. ISBN: 0673362353.

Llewellyn, Claire. *Chocolate (What's for Lunch).* Children's Press. 1998. ISBN: 0516262181.

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Llewellyn, Claire. *Eggs (What's for Lunch).* Children's Press. 1998. ISBN: 0516215477.

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Llewellyn, Claire. *Peas (What's for Lunch).* Children's Press. 1998. ISBN: 0516215493.

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Reid, Mary Ebeltoft. *Let's Find Out About Ice Cream.* Scholastic Trade. 1997. ISBN: 0590738003.

Repchuck, Caroline. *My Little Supermarket.* Millbrook Press, Inc. 1997. ISBN: 0761301453.

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The Hershey's Factory Tour. 2002. http://www.kidztown.com/factorytour.shtml

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How Peanut Butter is Made. Peanut Butter Lovers.com. 2002. http://www.peanutbutterlovers.com.

Just For Kids. Del Monte Foods. 2002. http://www.delmonte.com

Milk. Dairy Biz Moo Milk. 2002. http://www.moomilk.com

Processed Tomato Industry Information. 2002. http://www.tomatonet.org

Refining Sugar from Both Sugarcane and Sugar Beets. 2002. http://www.sugar.org

Refining Sugar From Sugar Beets (take the refinery tour). 2002. http://www.monitorsugar.com

Refining Sugar From Sugarcane. 2002. http://www.worldwidemart.com/starwing/refinery

Sights at Morning Star Farms - Los Banos. Tomato Processing. Morning Star Company. 2002. http://www.morningstarco.com

Sights In and Around Morning Star Packing - Yuba City. Tomato Processing. Harter Tomato Products, Morning Star Company. 2002. http://www.morningstarco.com

The Story of Florida Orange Juice. The Florida Citrus Web Site. 2002. http://members.aol.com/citrusweb/oj_story.html.

Tomato Facts. California Tomato Commission. 2002. http://www.tomato.org

USA Rice Federation. 2002. http://www.usarice.com.

EDUCATOR'S NOTES

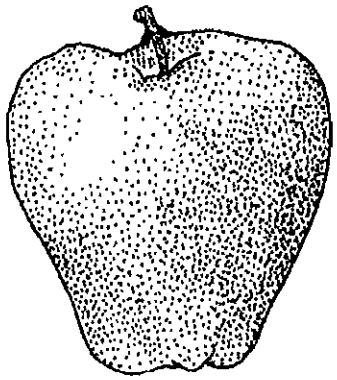
FOOD PRODUCTS

Raw Food Item	Possible Processed Products
apple	- apple juice, applesauce, dried apples, fruit rollups, jelly
beef animal	- bologna, corned beef, hamburger, liver, roast beef, steak
chicken	- broth, chicken meat parts, patties, soup
chicken eggs	- bread, brownies, cakes, cookies, donuts, egg rolls, ice cream, mayonnaise, noodles, omelettes, pastries, pickled eggs, powdered egg whites, quiche
corn	- cereal, corn chips, corn meal, corn oil, corn syrup, popcorn, tortillas
dairy cow	- butter, cheese, ice cream, milk, yogurt
grapes	- fruit rollups, grape juice, jelly, raisins
hog	- bacon, bologna, ham, hot dogs, pork chops, pork roasts, ribs, sausage
oranges	- marmalade, orange juice, orange slices
peanuts	- nuts, peanut butter, peanut oil
potatoes	- french fries, hashbrowns, instant mashed potatoes, mashed potatoes, potato chips
rice	- baby food, bread, brown rice, candy, cereal, pastries, pet foods, rice cakes, rice flour, rice pilaf, rice pudding, rice snacks, rice syrup, soup, Spanish rice, white rice
soybeans	- bean sprouts, cooking oil, flour, margarine, shortening, soy milk, soy sauce, tamari, tempeh, tofu
tomatoes	- canned tomatoes, ketchup, pizza sauce, salsa, stewed tomatoes, sun-dried tomatoes, tomato juice, tomato paste, tomato sauce, tomato soup
wheat	- bread, cereal, flour, pancakes, pasta

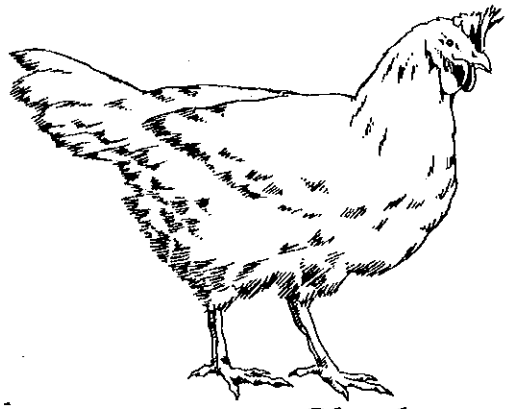
The ***Raw Food Pictures*** feature these 15 raw food items. This is a suggested list only. Students can decide on other raw foods they are interested in investigating. Some suggestions include sap from sugar maple tree, oats, and other grains. (An "other" and two "raw food of choice" cards are provided.)

RAW FOOD PICTURES

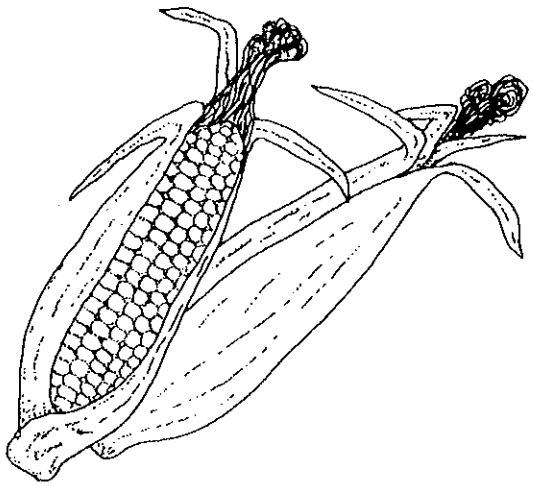
(Cut cards apart.)



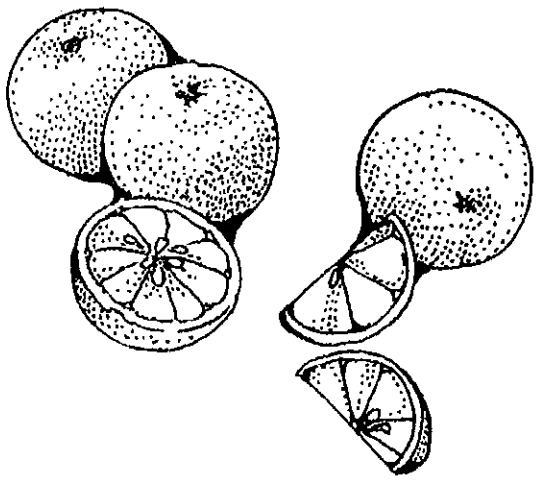
Apple



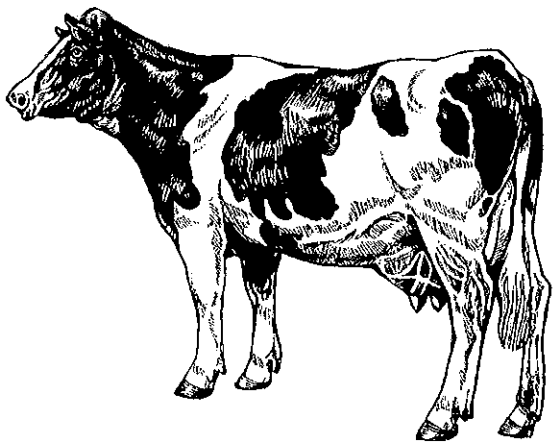
Chicken



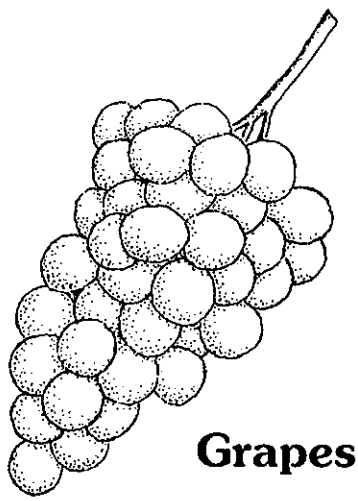
Corn



Oranges



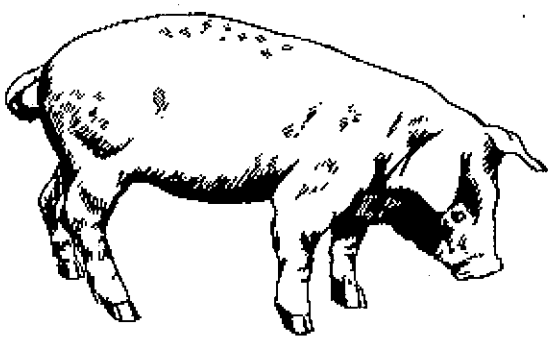
Dairy Cow



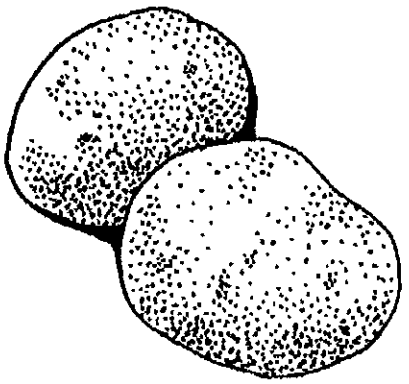
Grapes

RAW FOOD PICTURES (page 2)

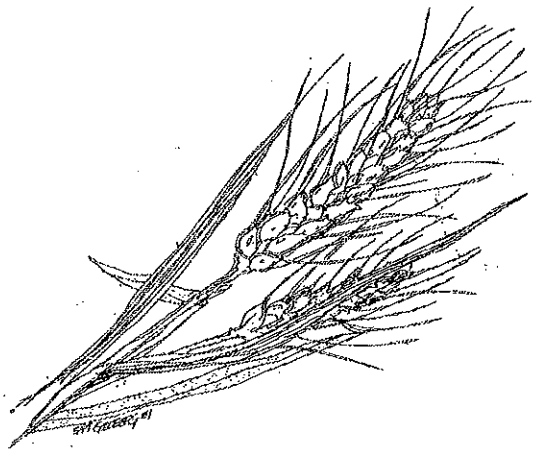
(Cut cards apart.)



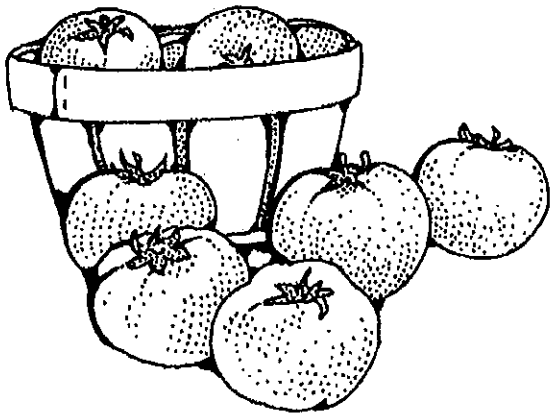
Hog



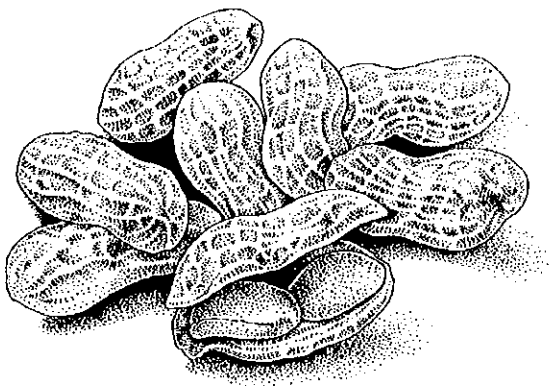
Potatoes



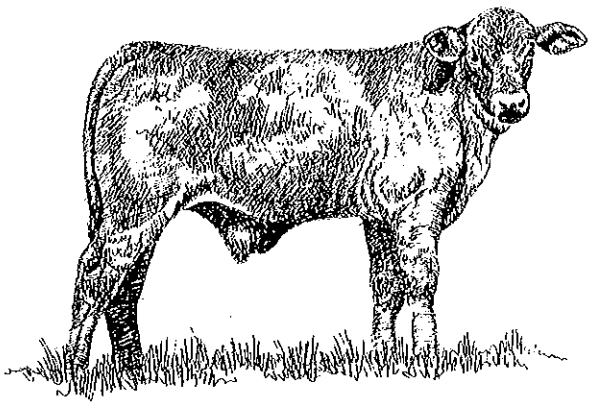
Wheat



Tomatoes



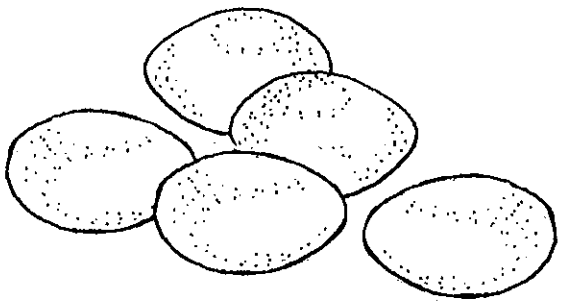
Peanuts



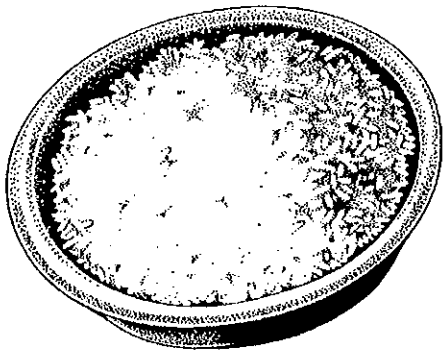
Beef Animal

RAW FOOD PICTURES (page 3)

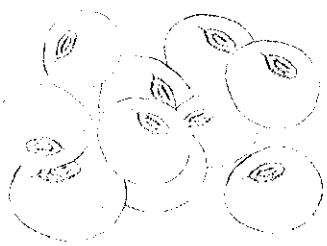
(Cut cards apart.)



Chicken Eggs



Rice



Soybeans

_____
(raw food of choice)

OTHER

_____
(raw food of choice)

Buzzy, Buzzy Bee

LEVEL: Grades 2-7
SUBJECTS: Science, Mathematics, Language Arts, Physical Education
SKILLS: Applying, comparing similarities and differences, computing, cooperating, creating and improvising, creating and interpreting graphs, describing, discussing, observing, recording, role-playing, understanding cause and effect

MATERIALS

Pictures of bees; 300 or more 2"x 5-1/2" paper strips, popsicle sticks or big bag of popped popcorn (if you do the activity outside); paper, or plastic bags; paper clips or clothes pins; transparencies of ***Parts of an Insect*** located in the Appendixes and the attached ***Parts of a Flower*** and ***Graphing Apples*** sheets. **Optional**: headbands for each student - 10 in one color and the others in a different color - and a hat for the apple producer, envelopes, scotch tape, and photocopies of ***Graphing Apples*** sheet.

VOCABULARY

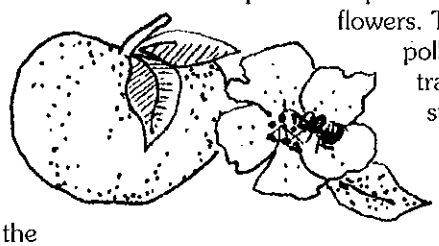
bee, beehive, drone, flower, fruit, insect, nectar, pollen, pollination, queen, stem, worker **Add for older students**: anther, filament, nectaries, ovary, petal, pistil, stamen, stigma, style.

RELATED LESSON

Investigating Insects

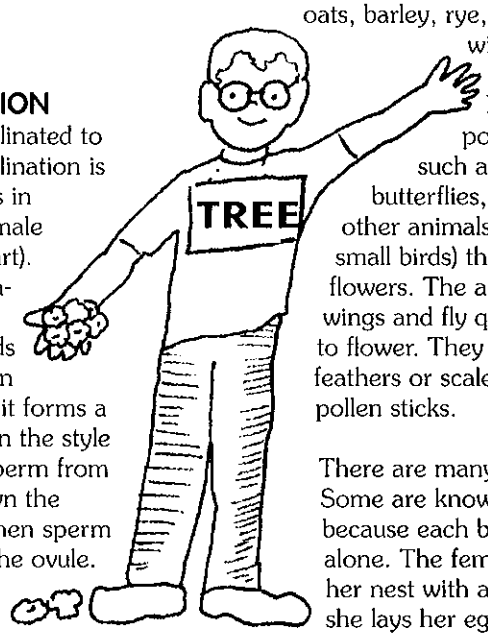
SUPPORTING INFORMATION

Many plants need to be pollinated to produce seeds or fruits. Pollination is the transfer of pollen grains in flowers from the stamens (male part) to the pistil (female part). Without pollination, fertilization does not occur, and plants will not produce seeds or fruit. When a pollen grain is deposited on the stigma, it forms a pollen tube that grows down the style to an ovule in the ovary. Sperm from the pollen grain travels down the tube. Fertilization occurs when sperm cells fuse with egg cells of the ovule. A seed then begins to develop. The ovary itself develops into fruit that encloses seeds.



Some plants can pollinate their own flowers. This is called self-pollination. Pollen is transferred from the stamen of the flower to the pistil of the same flower or to a separate flower on the same plant. Examples of self-pollinators include tomatoes, cotton, peas, some types of string beans, wheat, and some violets.

Other plants need pollen from another plant or even another plant variety. This is called cross-pollination and pollen is transferred from the stamen of one flower to the pistil of a flower on another plant. Plants that are cross-pollinated rely on external agents, such as insects, birds, some mammals, wind, or water for pollen transport. Conifers, many deciduous trees, and almost all grasses, such as corn, rice, oats, barley, rye, and bluegrass, are wind pollinated.



Many plants are pollinated by insects such as bees, ants, flies, butterflies, certain wasps, and other animals (e.g., bats and small birds) that find food in their flowers. The animals usually have wings and fly quickly from flower to flower. They usually have hairs, feathers or scales to which the pollen sticks.

There are many kinds of bees. Some are known as solitary bees because each bee lives and works alone. The female mates, makes her nest with about 10 cells where she lays her eggs (one egg per cell). The cells are stocked with pollen and

BRIEF DESCRIPTION

Students play a game in which they pretend to be honeybees and apple trees. In the process, they learn about plant pollination.

OBJECTIVES

The student will:
- review the process of plant pollination;
- demonstrate the sequence of plant pollination;
- describe the relationship between bees and flowers;
- graph the number of apples produced after pollination in the pollination game; and
- compare the effects of various conditions on pollination.

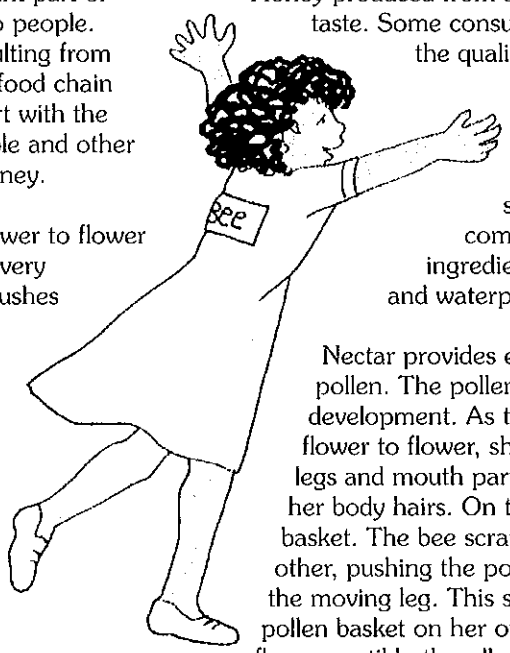
ESTIMATED TEACHING TIME

60 to 90 minutes.

nectar to feed the young. The female dies before the young hatch. The bumblebee and the honeybee, however, are called social insects because they live in groups (called colonies) and share the work.

A honeybee colony is like a huge family with 50,000 to 60,000 members. Three kinds of honeybees are in the family. The queen bee is the largest and most important bee. She can, however, be replaced. She lays thousands of eggs that will hatch into new bees. Male bees are called drones. Their job is to mate with the queen bee so she can lay eggs that hatch as larvae, transform into pupae, then emerge as adult bees. Worker bees are female bees that care for the queen and larvae, gather pollen and nectar, and make honey.

The work of honeybees is an important part of two different food chains beneficial to people. One food chain includes the fruit resulting from the pollination of flowers. The other food chain involves honey. Both food chains start with the flowers of plants. In both cases, people and other animals consume the fruit and the honey.



As the worker honeybee flits from flower to flower collecting nectar, pollen and water, a very important thing happens. The bee brushes against the pollen in the blossoms. Pollen, a tiny, grainy material, is made by the anther, which is located at the tip of each stamen (male part of a flower). The stamen is usually located at the top or outside of the flower. Pollen is usually yellow, but some flowers have white, red, blue or black pollen. For seeds and fruit to form, pollen must reach the female part, or pistil, of a blossom. The pistil is generally located in the lower or inner part of the flower. When the pollen meets the stigma on the pistil, pollination occurs.

Pollination stimulates fertilization of the flower. The pistil is made up of a stigma, a tubelike style, and an ovary that contains egg cells. Pollen from the bee goes down the style from the stigma to the ovary. When the pollen meets the egg cells in the ovary, fertilization occurs and seeds develop. If the blossom is a rose, rose seeds will be able to develop. If the blossom pollinated is an apple blossom, it is now possible for an apple to form.

Flowers and other blossoming plants have nectaries that produce sugary nectar. The nectaries are situated at the base of the petals. With the movable, flexible tubes of its mouth parts, the worker honeybee sucks up nectar and water. The worker bee stores the nectar in a special honey stomach. When its honey stomach is full, the bee returns to the hive. Then the bee regurgitates the nectar to other bees or puts it in an empty honeycomb in the hive. Natural chemicals from the bee's head glands and the evaporation of water from the nectar change the nectar into honey. Honeybee workers must visit two million flowers to make one pound of honey. The average worker makes only 1/12 teaspoon of honey in her lifetime.

Honeybees make honey and wax. There are as many different kinds of honey as there are plants from which to gather it. The color and flavor is determined by the source of the nectar and the age of the honey. Honey is quality graded much like maple syrup, eggs or meat. Honey produced from specific flowers has a distinctive taste. Some consumers select honey based upon the quality grade and flowers from which honey was produced. Nectar from orange, clover and alfalfa blossoms produces high-grade honey. Worker honeybees also secrete wax to form the honeycomb. This wax can be used as an ingredient to make candles, cosmetics, and waterproofing compounds.

Nectar provides energy, but bees also need pollen. The pollen provides food for growth and development. As the worker bee moves from flower to flower, she scrapes off pollen with her legs and mouth parts. Some pollen also sticks to her body hairs. On the hind legs of a bee is a pollen basket. The bee scrapes one hind leg against the other, pushing the pollen into the pollen basket of the moving leg. This scraping is also done for the pollen basket on her other leg. She continues visiting flowers until both pollen baskets are full. She then flies back to the hive, leaves the pollen with the other workers, and returns for more pollen.

Collecting food is a big job. The workers must gather enough food to feed the colony in warm weather and to store food for cold weather when there are no flowers. A honeybee colony uses 50 to 75 pounds of pollen each year. Once a worker starts to collect food (pollen and nectar), she does not live long, only about 14 days.

Students may have heard about "killer bees" (Africanized honeybees - a slight variation of the honeybee that escaped from a research center in South America in the late 1950s and has now migrated to the southern United States). Because of the frightening image of their name, it may be important to compare

them with the European honeybees. European honeybees are very similar in appearance to Africanized honeybees. Only experts can tell them apart. Both make honey. Both sting only once, and the venom of their stings is equally toxic.

Africanized honeybees, however, react with greater ferociousness to disturbances, such as the vibrations of grass mowers and other threats to their nests. They have been known to pursue people and animals for distances of a quarter of a mile or more. Africanized honeybees swarm (divide into two parts) to form new colonies more frequently than European honeybees. They also will nest in places European honeybees would avoid.

Some people are very allergic to bee stings. They require immediate medical care. Because pulling or squeezing a stinger actually releases more venom, stingers should be scraped from the skin. You can use a credit card, knife edge, or even a fingernail. Once the stinger is removed, wash the area with soap and water. Apply an ice pack to help the pain and swelling. The sting site may be treated with an antiseptic to prevent possible infection.

Most of the time bees gather food for themselves and pollinate flowers at the same time. The bees need the flower for food - pollen and nectar. The flowers need the bees so they can produce seeds or fruit. Thanks to the bees and the flowers, we have a variety of foods.

GETTING STARTED

Gather preserved bees, if possible, and books or visual aids with pictures of bees and honeycombs. Make transparencies of the ***Parts of a Flower***, ***Parts of an Insect***, and ***Graphing Apples*** sheets. Cut 30 2" x 5-1/2" paper strips with a paper cutter for each apple tree. (That may be a total of more than 300 strips.) For ease of handling, craft or popsicle sticks may be substituted for paper strips or popcorn, except for Step 10. Obtain paper or plastic bags and paper clips or clothespins for each tree (see Step 2). **Optional**: Make headbands for each student, 10 of one color for the trees and the rest another color for the bees. Obtain a hat for the apple producer. For older students, make individual photocopies of the ***Graphing Apples*** sheets, scotch tape, and three envelopes per bee for Step 10.

PROCEDURE

1. Ask students to tell you what they know about bees and why bees are important to people. Explain that honeybees are insects that live in colonies. In the colony live three kinds of honeybees: queen, drone and worker (see Supporting Information).

   Using the transparencies ***Parts of a Flower*** and ***Parts of an Insect***, briefly explain the process of plant pollination. Ask:

   - Why do bees visit flowers? What do they get from a flower? *(nectar and pollen)*
   - What does a bee get on its legs and body hair when it flies into a flower to get its nectar? *(pollen)* How? *(Pollen from the anther is transferred onto the bee because of its movement.)*
   - What happens to the pollen collected on a bee's body hair when it flies into another flower? *(Some pollen falls into the new flower, causing pollination.)*
   - What happens when a flower or apple blossom is pollinated? *(Pollen is transferred from the stamen [male part] to the pistil [female part]. It sets things in motion for fertilization to take place so seeds or fruit can be produced.)*
   - What would happen if the blossom or flower did not get pollinated? *(No seeds or fruit would be produced.)*
   - What are the steps involved in bee pollination? *(Bee enters flower for nectar, pollen, and water. Bee lands on the anther and gets pollen on its body hairs and legs. Bee moves to stigma of same or another flower and leaves pollen behind. Pollination stimulates fertilization and the production of seeds and fruits.)*
   - After a flower is pollinated what occurs? *(Pollen tube develops, sperm from pollen grain travels down tube and unites with egg in ovule, and fertilization occurs.)*

2. Play a game with students to dramatize how flowers are pollinated. Each student plays the role of an apple tree, a Buzzy Bee or the apple producer. Students can wear headbands of different colors to differentiate the roles.

   Designate one student as the apple producer who owns the orchard. Give the apple producer the hat. There are 10 apple trees and they wear the 10 headbands of one color. Other students are bees and wear the other color headbands. Each apple tree holds about 30 paper strips or a handful of popcorn (more than enough to accommodate the total number of bees).

Give each tree a paper or plastic bag. Use a paper clip or clothespin to attach a paper bag to the collar or neckline of each tree. Or, tie a plastic bag to a belt or belt loop of each tree. The bags will be used to collect paper strips from the bees in Step 4.

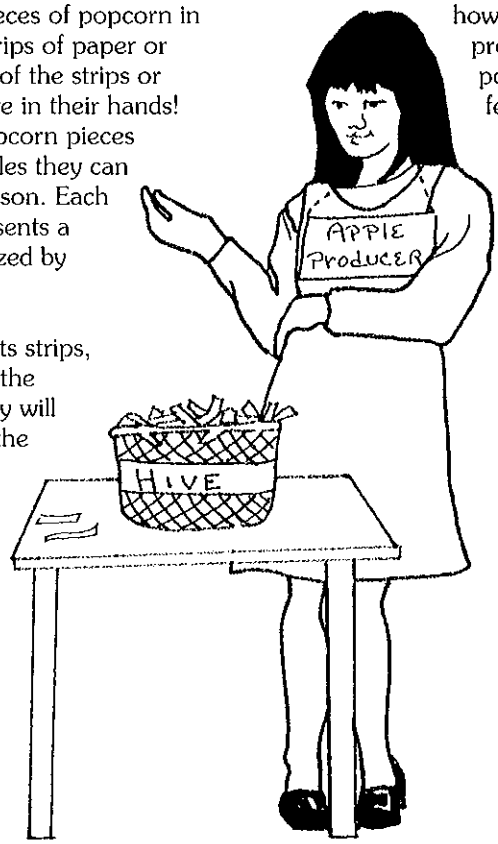
3. Designate a spot as the beehive. Younger students can practice how bees fly and get nectar out of a flower to dramatize the pollination process.

4. To play, each Buzzy Bee buzzes and flies from one tree to another. The bees take one paper strip or piece of popcorn from the tree they visit and place it in the bag of another tree. They receive another paper strip or piece of popcorn from that tree. (At the start of the game when visiting the first tree, the bees only receive a paper strip or piece of popcorn, since the bees do not have anything to leave yet.)

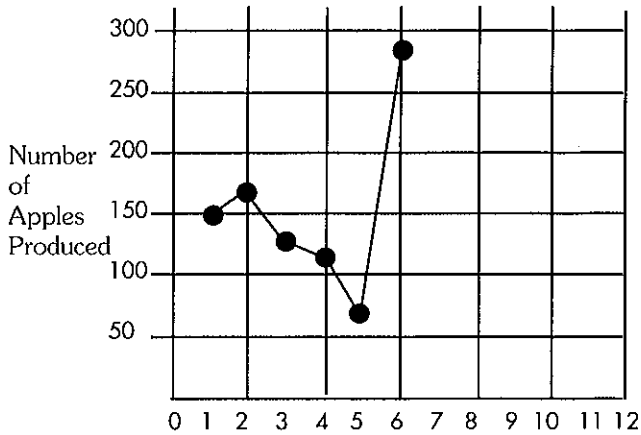
   One minute represents one growing season. Allow only one minute for the bees to fly from one tree to another, leaving and receiving a paper strip or piece of popcorn. On a designated signal, the Buzzy Bees return to their hive, leaving their paper strip or piece of popcorn in the bag of the last tree they visited.

5. The apple producer tells the trees to count the number of paper strips or pieces of popcorn in their bag. Include only the strips of paper or popcorn in the bag, not any of the strips or popcorn pieces the trees have in their hands! Tell students the strips or popcorn pieces represent the number of apples they can grow in their tree for this season. Each strip or popcorn piece represents a blossom pollinated and fertilized by the bees.

6. After each tree has counted its strips, have the tree individually tell the apple producer its total. (They will use the strips or popcorn in the next growing season.) The producer writes each total in a visible place and totals the number of "apples" produced by all the trees. The apple producer graphs that number on the ***Graphing Apples*** transparency above the first growing season.



Graphing Apples



Optional: Older students can graph the total number of apples produced each growing season on their graphs or copy all the growing seasons onto their graph at the conclusion of the game.

7. Play the game numerous times for one minute intervals. Remind students that each minute represents a growing season. Be sure that at the end of each minute, the trees total the apples produced. Remind the producer to record and graph the figures. Challenge students to describe how and why the trees are able to produce their fruit. The blossoms pollinated by bees will generally lead to fertilization and fruit production.

8. Play the game for at least three more seasons, but vary the pollination conditions (see below). You can choose one or more conditions from the list. The group adjusts its role playing to match the pollination condition. Growing seasons continue to be one-minute intervals.

Some Pollination Conditions

- The weather has been especially cold, so the bees are slow and sluggish - flying at only about half speed.

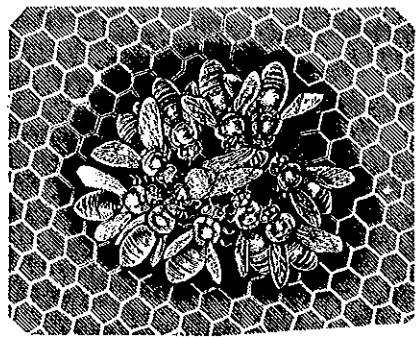
- The winter was harsh. A virus killed many of the bees in the hive. Only half the bees are left to do the job. Have half the bees sit on the floor or stay at the hive.

- Since the hive was overcrowded, half the bees swarmed (left the area entirely). There aren't as many bees left to do the pollination job.

- The apple trees were damaged in an ice storm. (Only half of the tree branches have pollen. Cut the pollen strips available in half.)

- A late frost hit the orchard. (They may have been pollinated, but then damaged. Go around and collect the paper strips from some of the trees.)

- A very brisk wind has been blowing. Bees either stayed in the hive or stopped working in the field. They will find shelter until the wind stops.



9. Graph the total number of apples produced on the ***Graphing Apples*** transparency. Indicate the weather conditions. Compare the data for all the growing seasons. The totals should vary from season to season. Ask students to explain possible causes for the differences by asking:

   - What do you notice about the number of apples produced during each season?

   - Did the total number of apples produced during each growing season stay the same? Why or why not?

   - Why do you think the totals are different? (Discuss any specific circumstances for individual growing seasons and the effects on the total number of apples produced.)

   - What does this tell you about the relationship between bees and flowers. *(The bees need the flowers for food and the flowers need the bees to be able to produce seeds and fruit.)*

   - Why are bees important to agriculture? *(Many fruits and vegetables develop as a result of pollination and fertilization of flowers. Honeybees change nectar from flowers into honey.)*

   - If you were an apple producer or orchard owner, what would you do to assure good pollination and fertilization for your apple trees? *(Rent and release bees in the orchard at the first sign of bloom.)*

   - What is the most interesting thing you learned about bees and pollination?

Optional for older students

10. Play the game this time with bees gathering nectar and pollen. At the end of the game students determine the amount of honey produced and pollen gathered. Using scotch tape or paper clips, have the bees attach an envelope to each leg (representing pollen baskets) and an envelope to their stomachs (representing the honey stomach). When bees take a paper strip from the tree, have them tear off two small pieces of paper - one to put in one of their pollen baskets and one to put in their honey stomach. The rest of the paper strip goes in the trees' bag. Play the game for several minutes. At the end, the bees return to the hive. Ask one bee at the hive to collect the pollen and nectar pieces as each bee empties their pollen baskets and honey stomach. (You may want to have two piles - one for pollen, the other for nectar - keeping the pollen and nectar separate.)

11. Have students determine how much nectar was gathered and made into honey. Tell students that 12 pieces of nectar paper represents one teaspoon of honey. Since six teaspoons equals one ounce, how many ounces of honey did the bees produce? How many pounds?

12. Have students determine how much pollen was gathered. Tell students that 72 pieces of pollen paper represents one ounce of pollen. Ask:

    - How many ounces of pollen did the bees gather? How many pounds?

    - A honeybee colony uses 50 to 75 pounds of pollen each year. Did the bees gather enough pollen for the colony to survive?

EVALUATION OPTIONS

1. Have students draw a sequence story of the Buzzy Bee game, including how plants are pollinated.

2. Have students write a paragraph describing why bees are important in the pollination of apple tree blossoms and explaining conditions that affect

pollination. Have them include one way the weather could hurt, slow or stop bees from pollinating and one way the weather could help bees pollinate apple trees.

3. Have students write or draw about their attitudes toward bees. They could do a "before" and "after" comparison.

4. Give students a graph showing 15 apples produced in the first season, seven in the second season, and 14 in the third season. Have students describe conditions that might have affected the pollination.

EXTENSIONS AND VARIATIONS

1. Discuss what the bee does with the nectar that is collected from each flower. Where does honey come from, and how do animals and people use honey? Bring samples of honeycomb and honey for the students to observe and taste.

2. Students display their data using different kinds of graphs. Options include bar graphs, picture graphs and pie charts (see sample ***Pie Chart*** located in the Appendixes.) Have students compare and select their favorite visual display of data.

3. Ask local grocery stores or florists to save discarded flowers of various varieties. Have the students use hand lenses to study the parts of the flower. Ask them to look for pollen and then take apart the flowers. Have them draw and label the different parts of the flower.

4. Investigate what fruit producers do to bring insects into their fields and orchards for pollination. Take a field trip to an orchard or farm.

5. Invite a fruit producer or beekeeper to come to the classroom to discuss pollination and apiaries (places where bees are kept or collections of hives or colonies where bees are kept for their honey). Ask the beekeeper to bring his or her equipment and explain how different flowers make different tasting honey.

6. Research other insects, birds or mammals that are pollinators. List the factors, such as color, shape, fragrance and time of pollination (day or night) that attract pollinators. Examples include butterflies, moths, beetles, ants, hummingbirds, bats, cactus wren, mouse, and large animals that may brush against flowers.

7. Have students investigate "killer bees" (Africanized honeybees), their origin, migration patterns, differences between them and European honeybees, potential for interbreeding between the two honeybees, concerns about them, safety procedures, and other topics of interest. Chart the migration patterns. Ask, "How might interbreeding between the two bees affect the manageability and effectiveness of bees as pollinators?"

8. Research other methods of plant propagation besides the formation of seeds (e.g., grafting, cutting, or breaking plant apart). Have students give examples of plants that are propagated in different ways. Have them create charts that illustrate the various methods of propagation.

ADDITIONAL RESOURCES

All About Apples (Education Kit with Poster). Unique Country Products, 250 Westfield Street, West Springfield, MA 01089. (413) 732-4437.

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National Honey Board, 390 Lashley Street, Longmont, CO 80501-6045. 1-800-553-7162 or (300) 776-2337. fax (303) 766-1177. http://www.nhb.org

Parramon, Jose. *The Fascinating World of Bees*. Barron's Educational Series, Inc. 1991. ISBN: 0812047206.

Patent, Dorothy Hinshaw. *Apple Trees*. Lerner Publishing. 1997. ISBN: 0822530201.

Pranis, Eve, Joy Cohen. *Grow Lab: Activities for Growing Minds*. National Gardening Association, 180 Flynn Avenue Suite 3, Burlington, VT 05401. (802) 863-1308. http://www.garden.org. 1997. ISBN: 091587332X.

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Starosta, Paul. *The Bee: Friend of the Flowers*. Charlesbridge Publishing, Inc. 1993. ISBN: 0881064300.

Suzuki, David. *Looking At Plants*. John Wiley & Sons. 1992. ISBN: 0471547484.

The Honey Files: A Bee's Life (videotape, teacher's guide, and worksheets). National Honey Board, 390 Lashley Street, Longmont, CO 80501-6045. 1-800-553-7162 or (300) 776-2337. fax (303) 766-1177. http://www.honey.com

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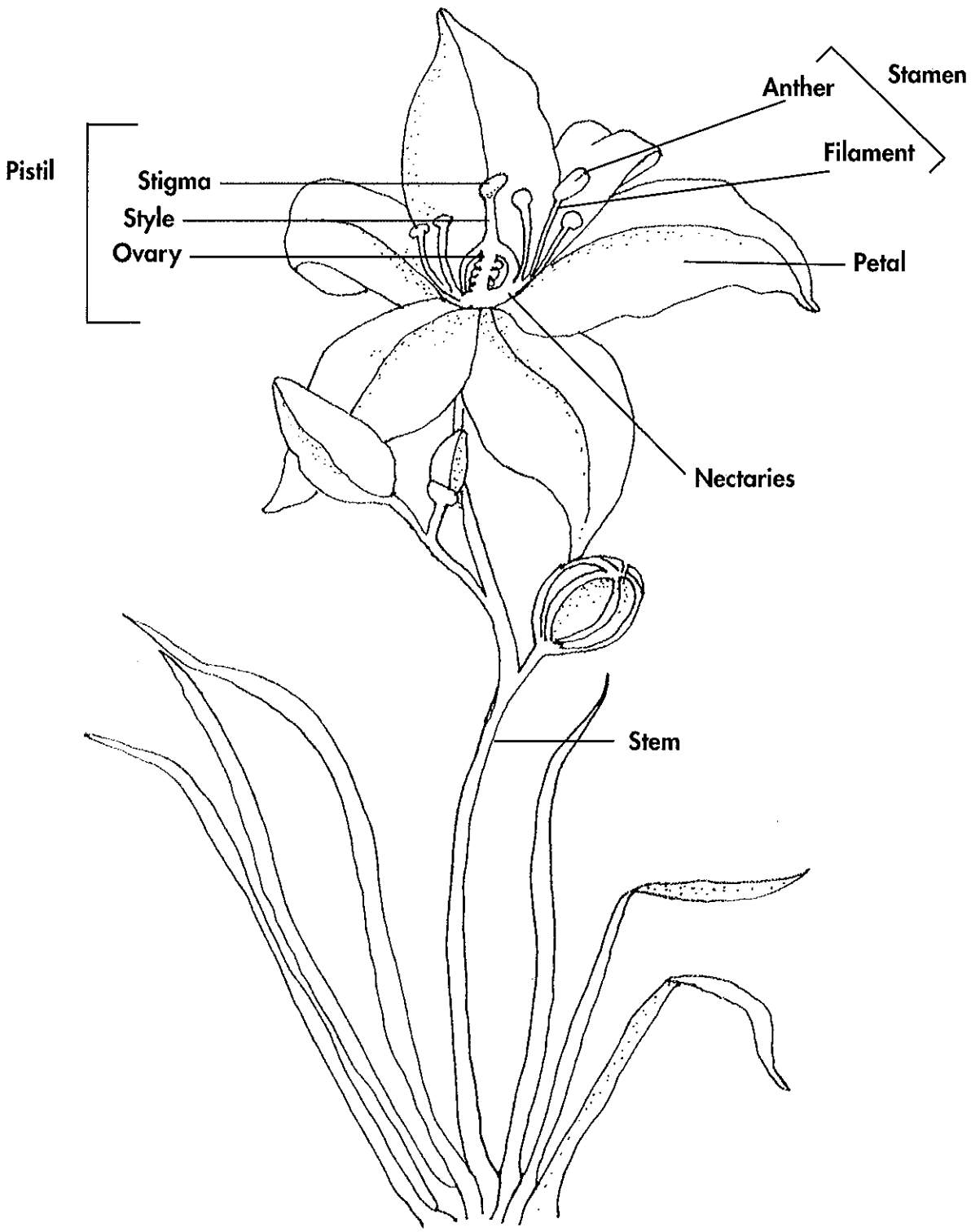
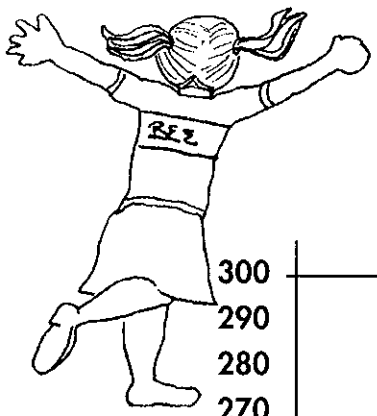
EDUCATOR'S NOTES

PARTS OF A FLOWER





GRAPHING APPLES

NUMBER OF APPLES PRODUCED

300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

GROWING SEASON

If you desire peace, cultivate justice

but at the same time cultivate the fields

efficiently to produce more bread,

otherwise there will be no peace.

Norman Borlaug,
1970 Nobel Peace Prize Recipient

Root, Root for Life

LEVEL: Grades 2-6
SUBJECTS: Science, Language Arts
SKILLS: Analyzing, applying, collaborating, collecting data, comparing similarities and differences, concluding, cooperating, describing, developing vocabulary, discussing, drawing, evaluating, explaining, following directions, identifying, inferring, observing, predicting, recording, understanding cause and effect, writing

MATERIALS

One mature potted houseplant (with holes in bottom of pot), one empty pot with holes, small bag of potting soil, sharp knife, toothpicks, small container of salt, three bowls, teaspoon, water, paper towels (brown is best), markers, drawing materials, student journals or notebooks, masking tape, magnifying glass or hand lens, dictionaries, encyclopedias, and the Internet for reference, examples of different root systems (such as houseplant, sod/grass, carrot with top, beet with top), a variety of roots commonly eaten by people (carrots, ginger, jicama, parsnips, radishes, beets, turnips), bedding plants, small clear plastic cups, sweet potatoes, photocopies of attached ***Route to Roots*** station signs and ***Root Drawings*** sheets. **Optional**: tweezers.

VOCABULARY

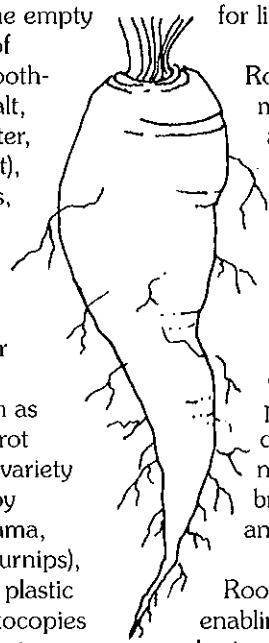
active transport, erosion, fibrous roots, leaves, minerals, nutrient, root hairs, roots, soil, stem, taproots, xylem

RELATED LESSONS

Fruits and Veggies
The Plant and Me

SUPPORTING INFORMATION

Ready to unearth some facts about roots? We might find 13 million roots in 2 cubic feet of soil. End to end, they could reach from where you sit to a town hundreds of miles away. But because we do not readily see them, it's easy to overlook the value of roots. Food chains all start with plants, and roots are a plant's critical lifeline. That's why we are here to root for roots...and root, root for life!



Roots play a vital role to help plants meet their basic needs. They anchor the plant in the soil, provide support, and absorb necessary water and nutrients from soil (or other growing medium). Many roots are further specialized to store sugars and other carbohydrates and nutrients that the plant can use to carry out other functions. (Note: Not all plants have roots [e.g., algae] nor do all plants absorb water and nutrients through their roots [e.g., bromeliads use roots only as an anchor].)

Roots and stems form a partnership, enabling most green plants to meet their basic needs for nutrients and water. Soil nutrients are first absorbed through roots. Absorption of water and minerals occurs primarily through tiny root hairs. Through a process called active transport, soil nutrients move up into other parts of plants. They are then built into the tissues of the plant as it grows and matures. Most of the water absorbed by roots is used to replace water lost from leaves as they transpire (lose water by evaporation from leaves and stems) through pores, called stomata, during the photosynthetic process.

Plants have many different root structures. As a seed germinates, the first part to emerge is the primary root. It anchors the plant and begins to absorb water and minerals so the shoot can develop. From that point on, root development depends on the type of plant. Some plants have a

BRIEF DESCRIPTION

Students discover the importance of roots to plants, soil and people during hands-on learning-station activities.

OBJECTIVES

The student will:
- identify at least three ways in which roots help plants;
- explain how roots help the soil;
- list three reasons why roots are important to people;
- compare taproots and fibrous roots;
- observe roots and write observations;
- grow plants from roots; and
- eat and evaluate roots.

ESTIMATED TEACHING TIME

Session One: 20 minutes for introduction and one-and-a-half to three hours to move through six learning stations.
Session Two: 30 minutes for conclusion.
Session Three: 30 to 60 minutes for root-tasting feast.

Stations can be done as whole-class demonstrations for grades 2-5, as stations for grades 2-6, or as two stations a day for three days. An adult or upper-grade facilitator per station may be helpful when groups from grades 2 and 3 move through the stations.

primary taproot with a few smaller, hairy branches. These long, strong roots reach deep under the soil surface, pulling up nutrients and water from far below. Dandelions are examples of plants with taproots. Many plants such as carrots, sweet potatoes, beets, radishes, and turnips have taproots that expand in size and become storage sites for sugars and starches. People often harvest and eat the taproots before the plants use their stored food to make mature plant structures such as stems, leaves, flowers and seeds.

Other kinds of plants have a fibrous-root system. You can identify these by a network of branching rootlets and root hairs appearing off primary roots. These networks can be extensive, which makes them particularly good at holding onto soil particles. Beans, tomatoes and grasses are examples of plants with fibrous-root systems.

In both taproot and fibrous-root systems, tiny root hairs are the bridges between the root and the water and dissolved nutrients in the soil. These root hairs provide a huge surface area for absorbing water and nutrients. If these root hairs are broken or damaged, a plant will have trouble meeting its needs for water and nutrients.

Root hairs are fragile, but root tips are protected by a cap of cells. Root tips have concentrations of plant growth hormones called auxins that cause these cells to divide and grow larger. Dead root cap cells are shed ahead of the root tip, making a pathway that allows the delicate root to work its way through the soil, around hard objects, and into tight places. That is how growing roots can exert enough force to crack concrete, pipes, and rocks.

Roots are valuable in many ways. Not only do they help feed the plant, hold soil in place, and prevent erosion - wearing away of soil by water, ice, or wind - but they help keep water and air clean. Eroded soil can end up as sediment that clogs streams and dirties the air. By breaking off tiny pieces of rock as they grow through cracks in rocks, roots assist the long process of soil formation. Some roots produce substances that help dissolve rocks. Living roots aerate and loosen soil which is a help to burrowing insects and animals. Dead and decomposed roots contribute to the rich humus in the soil.

Because roots store sugars and starches for plants, many are sweet and nutritious food sources for people and other animals. This is nothing new. It might surprise your students to learn that hunting and gathering to meet needs for food, fuel, clothing and shelter has been a significant occupation of people since they have been on Earth. Throughout human history many societies have gotten all their food by gathering wild plants, hunting and fishing.

All around the world, roots are basic sources of nutrition to people and many animals; a root's nutrients are passed on to those who eat them. Sweet potatoes, carrots, beets, turnips, and radishes are actually plant food-storage roots. The roots of the tropical plant cassava give us the tapioca we use in desserts, and cassava is a food staple in many tropical countries and in South Florida. Poi is a nutritious native Hawaiian food made from the root of the taro, which is cooked and ground to a paste then fermented. Carrots, ginger, jicama, parsnips, radishes, beets, rutabaga or Swedish turnip, and turnips are great-tasting, nutritious root foods that we can all enjoy.

Yams are a staple in Africa and potatoes are familiar mainstays to most of us. But potatoes are tubers, not roots. What's the difference? The roots mentioned previously are naturally modified *root structures,* whereas bulbs and tubers are modified *stem structures.* Bulbs and tubers are sometimes mistaken for roots because they also grow underground. This lesson is a good time to get to the root of the distinctions among roots, bulbs and tubers — many of which are nutritious foods.

Roots and stems have different cell arrangements as seen under a microscope; that is how scientists determined that a potato is not a root, but actually a stem structure or tuber. Tubers are swollen, fleshy, usually oblong or rounded thickenings of underground stems, bearing tiny buds called eyes from which new plant shoots arise. Examples of tubers people eat are the potato, Jerusalem artichoke (not a true artichoke, but the tuber of a sunflower), and water chestnut. Bulbs are short, modified, underground stems. Examples of bulbs we eat are onions, scallions, leeks, garlic, kohlrabi, and shallots.

In some places, roots are important parts of celebrations or holidays. In Oaxaca (wa-HAH-kah), Mexico, it's a custom each December before Christmas for farmers to entice shoppers to buy their produce by carving radishes into figures or designs to depict a story. December 23 is called the Night of the Radishes. Also in Mexico, a unique sweet called camote, or sweet potato candy, is served on Cinco de Mayo (May 5) to celebrate Mexico's victory over the French in the Battle of Puebla. Camote is made and sold in dozens of shops throughout Puebla, as well as in our own Southwest. (See the camote recipe in Extensions and Variations 9.) And in the United States, many Thanksgiving tables offer candied sweet potatoes as a traditional favorite.

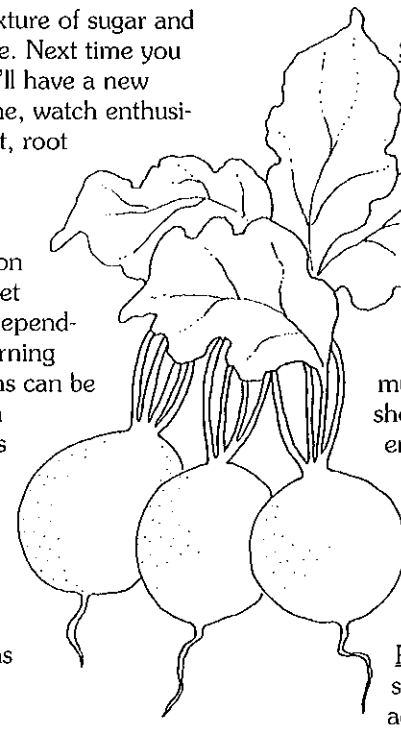
This lesson offers an opportunity to point out another important distinction: sweet potatoes and yams are as different as tomatoes and apples. Sweet potatoes *(Ipomoea batatas)* are from the morning glory family *(Convolvulaceae).* They have a moist, soft flesh and

are traditionally grown in the South. Yams are the very large (sometimes weighing as much as 100 pounds), fleshy, edible tuber of a climbing tropical plant (family *Dioscoreaceae* and genus *Dioscorea),* native to southeast Asia, Africa, India, and parts of the Caribbean. Yams are a major food crop in many tropical countries such as New Guinea and western Africa. True yams are rarely seen in American markets. In the United States, what we call yams are a northern variety of sweet potato with a rather deep orange color and moist flesh. No yams are grown in the United States because of the relatively cold climate and short growing season. The sweet potato is also unrelated to the potato. The potato belongs to the nightshade family *Solanaceae.* In addition, potatoes are tubers, but sweet potatoes are roots.

Finally, what do roots have to do with that thirst-quenching favorite called root beer? This effervescent soft drink is flavored with a syrupy mixture of sugar and the bark and roots of the sassafras tree. Next time you and your students taste root beer, you'll have a new appreciation for roots. In the meantime, watch enthusiasm take root as students learn to root, root for life!

GETTING STARTED

Consider doing this lesson in the season when carrots with green tops and sweet potatoes are abundant (spring or fall depending on where you live). Set aside a learning station area in your classroom. Stations can be modified for two to three students at a time or for whole-class demonstrations or lessons. Decide how many groups there will be depending on the independence and number of your students. For each station, gather the following materials for each group and/or demonstration. Allow yourself about one hour to set up all six stations once you have materials.



Station 1: Purchase a flat of "bedding plants," get small potted houseplants, or start your own seedlings a minimum of two weeks ahead of the lesson. (Beans, marigolds, radishes, and carrots are quick germinators, show both taproot and fibrous-root systems among them, and are fun for students to grow.)

Station 2: Bowl with one cup of water, one paper towel (brown is best), 1/2 teaspoon of salt.

Station 3: One mature potted plant (with drainage holes in bottom of pot), one pot (with holes in the bottom) of soil with no plants (soil may need to be refilled after each group), two bowls to capture the water, two cups of water (one cup for each pot), one paper towel.

Station 4: Root samples from four different plants (include at least one tap and one fibrous-root sample), one ***Root Drawings*** sheet per student, a magnifier or hand lens. You may use freshly pulled (or dug) weeds, root vegetables, or seedlings, and be sure the root systems are kept moist to keep them alive. Tweezers can be helpful when comparing roots.

Station 5: Several kinds of root foods for students to observe and draw (jicama, beets, carrots, radishes), drawing materials for each student. Try to locate a grocery store or farmers' market where root vegetables still have the leaves attached. Students can help by bringing items from home. If you do not use real items, provide reference books (encyclopedias, dictionaries, the Internet, science textbooks) with good illustrations of root foods from which students can make observations and drawings.

Station 6: Four to six toothpicks, sharp knife, marker, masking tape, water, plastic cups, small sweet potatoes with "eyes." Use a whole sweet potato, if you conduct this station as a whole-class demonstration. Otherwise, cut the sweet potatoes into sections and allow them to air dry for 24 hours. (Wet pieces placed in water may rot.) Each piece of sweet potato must contain at least one eye (an immature shoot) in order to sprout. You will need enough clear plastic cups, toothpicks ,and sweet potato pieces with "eyes" to provide each student or every group, whichever you decide is suitable. Allow two subsequent weeks for growing the sweet potatoes.

Root-tasting Feast (Session Three): Enlist student and parent cooperation in advance to supply a sharp knife, paper plates or napkins (one per student), carrots, ginger, jicama, parsnips, radishes, beets, sweet potatoes, rutabaga (Swedish turnip), and turnips. Try to get these roots in raw form to cut up and as ingredients in various prepared dishes for tasting. A successful feast will have plenty of samples, as well as family recipes using root ingredients. Encourage a variety of forms of root food: carrot cake, carrot juice, pickled beets, radish sandwiches, ginger tea, stews, raw kohlrabi pieces to dip, and others.

Photocopy and cut apart the ***Route to Roots*** station signs and direction sheets, staple on individual pieces of construction paper, and post at each station. Each student needs a photocopy of the ***Root Drawings***

sheet and notebook or science journal for recording results. **Optional**: You may choose to copy the questions for each station onto reproducible sheets so each student can take a copy back to his or her desk to complete.

Decide how and when you want the groups to work their way through the stations, or if you will do each station as a whole-class demonstration. If you decide to do the stations in small groups, arrange for station facilitators for younger students.

Read through the Supporting Information and ***Route to Roots Station Answers*** at the end of the lesson before you begin. Also make sure that facilitators are familiar with the Supporting Information, procedures, and answers for their stations, because they will be directing the younger students.

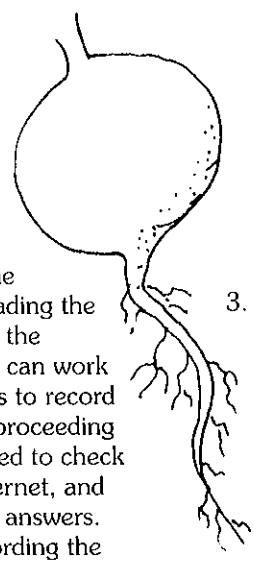
Decide on a date for the root-tasting feast so students can bring items from home. Write a letter to parents explaining the project and asking them to help students provide samples of roots and family recipes using root ingredients. You may want to include some of the examples suggested in Session Three.

PROCEDURE

SESSION ONE (When Conducting the Six Stations)

1. Introduce the lesson by announcing that students will be working in learning stations to observe plant roots and to learn how roots are important to plants, soil, animals and people. Share all of the Supporting Information or parts your students would find interesting.

2. Divide the class into groups of two or three students. Explain the procedure for working through the stations independently. If you have facilitators at each station to help, explain that the person is there to guide the students through the activity. The directions and materials will be at each station. Group members may share and change roles, but one student (or the station facilitator) is in charge of reading the station directions aloud and leading the discussion at each station. Students can work at the station area or return to seats to record answers in their notebooks before proceeding to the next station. Groups may need to check dictionaries, encyclopedias, the Internet, and science textbooks for some of their answers. Each student is responsible for recording the answers to the questions and the observations and results in his or her notebook or science journal.



SESSION ONE (When Conducting Stations As Demonstrations or Lessons)

1. Introduce the lesson by announcing that students will watch six different demonstration stations to observe plant roots and to learn how roots are important to plants, soil, animals and people.

2. Plan one and one-half hours to go through the six stations for older students and up to three hours for younger students. Explain that the directions and materials will be at each station. You will lead the demonstration and discussion at each station; the students will then return to their seats to record answers in their notebooks or science journals before proceeding to the next station. Students may need to check dictionaries, encyclopedias, the Internet, and science textbooks for some of their answers. Each student is responsible for recording the answers to the questions and the observations and results in his or her notebook or science journal.

SESSION TWO

1. Have students sing the folk song Sandy Land from the state of Oklahoma.

2. After students have completed all the stations, lead a discussion of students' observations and results. In a visible place, list their findings and/or conclusions about the importance of roots. What did students learn about these roots? For example:

   - Roots hold plants in place.
   - Roots soak up water.
   - Roots hold soil in place.
   - The roots of different plants are different.
   - Roots are the bottom or lower part of a plant.
   - Roots usually grow under the ground.
   - New plants can grow from some roots.
   - Some roots are taproots and we eat them as food.
   - Roots grow away from light and in places where they can get water.

3. Explain that another way in which roots help plants is by storing nutrients for the plant itself, as well as for people and animals. Ask:

   - What is a nutrient? *(Something people, animals, or plants need for life and growth.)*

   - Where does the plant get nutrients? *(A plant's nutrients come from the minerals in the soil. Minerals are substances found in nature that*

are not living. Calcium, magnesium and potassium are examples.)

- What does the plant do with the nutrients? *(The plant uses nutrients to build its tissues as it grows and matures. Plants often store excess nutrients in roots or other parts.)*

- How does this help people? Animals? *(When people and animals eat plant parts, the plant's nutrients become theirs for growth and health.)*

- What roots do people eat? *(Carrot, ginger, jicama, parsnip, radish, beet, rutabaga, sweet potato, and turnip. Other edible underground plant parts that are tubers and bulbs include potato, onion, kohlrabi, garlic, and so on.)*

- What other plant parts do we eat? *(Leaves as in lettuce, spinach and cabbage; stems, as in celery and asparagus; modified stems or tubers, as in potatoes and yams; flowers, as in broccoli and cauliflower; seeds, as in sesame and sunflower; fruit, as in apples and oranges.)*

SESSION THREE

1. Have the class plan a root-tasting feast that will include an evaluation of the root foods. Plan the menu by inviting the students to volunteer to provide samples of root foods that are eaten by their families. Encourage culturally diverse dishes and a variety of forms that may use roots: carrot cake, carrot juice, carrot medallions, carrot sticks, pickled beets, hot fresh beets in butter sauce, radish sandwiches, radish blossoms, ginger tea, gingerbread, candied sweet potatoes, sweet potato pie, camote, hot mashed jicama, fresh crisp jicama sticks with lime juice, etc. Once the list is complete add root foods that the students are not familiar with: turnips, rutabagas, vegetable oysters, parsnips, etc. Decide whether guests should be invited and asked to join in the evaluation.

2. Have the class create a rubric that all students can use to evaluate the root dishes. Include the likes and dislikes of the students as well as color, taste, texture, and other generic observations. From this work develop an evaluation form for all students to use.

3. Conduct the root-tasting feast serving the root foods planned by the class and have the students complete the evaluation forms that they have designed.

EVALUATION OPTIONS

1. Evaluate students' recording of answers, observations and results in their notebooks or science journals and their ***Root Drawings*** sheet for understanding and completeness. Also rate their participation and capability to move through the learning stations.

2. Have students complete a landscape picture, including views above and below the ground, by drawing appropriate roots (tap or fibrous) on the plants in the picture. Have the students label both the taproots and fibrous roots in their drawing

3. Have students illustrate verbally or in a drawing how roots help plants and soil - or how the lack of roots would affect plants and soil - and are important to people.

4. Have students complete one or more phrases.

   - The most interesting thing I discovered about roots is...

   - My favorite root to eat is _____ because...

   - Two reasons roots are important to me are...

5. Have the students create a graph from their root evaluation in Session Three or write a food review from the evaluation and the root-tasting event.

EXTENSIONS AND VARIATIONS

1. Fill glass jars or clear plastic cups with potting soil or damp paper towels and plant large seeds such as beans next to the sides of the jars. Have students observe root growth and development and record notes in a science journal. Point out that this is how we propagate or grow plants using seeds. Remind students that they grew plants another way during Station Six, planting a piece of sweet potato with an "eye."

2. Investigate plant propagation using stem cuttings. Provide pots, potting soil, and houseplants such as begonias, Swedish ivy, philodendron, and zebrina. Invite a master gardener to demonstrate and explain this and other methods of plant propagation, if you are not comfortable doing so, then have students try propagating their own plants by different methods. Students can experiment to determine the smallest piece of potato that can produce a new plant.

3. Investigate bulbs and tubers, other fleshy, edible plant parts that are sometimes mistaken for roots because they also grow underground. Bulbs we eat include leeks, onions, scallions, garlic, kohlrabi, and shallots. Tubers we eat are Jerusalem artichokes (not a true artichoke, but the tuber of a sunflower), potatoes, and water chestnuts. What are some differences and similarities in shape, color and taste among roots, bulbs and tubers?

4. Have students research the minerals needed by plants, animals and people for survival.

5. Sing the praises of roots. Have students work cooperatively to write a song summarizing their learning. Start with the tune to "Row, row, row your boat," and sing the words: "Root, root, root for life. . .." Your students will take it from there!

6. Make veggie jewelry. Have students cut carrots, parsnips, and sweet potatoes into half-inch cubes. They can string them randomly in a pleasing pattern of colors using a large needle and sturdy thread in a length they would like. Tie the ends of the thread together after stringing and hang to dry. Even adults will enjoy wearing these colorful "beads"! (Avoid beets because they stain.)

7. Keep an ongoing class chart of vegetables you grow or study including the following categories: vegetable, plant part, how it helps us, how it helps the plant, ways we eat it, and more.

8. Create root-growing gloves to show root growth, how seeds sprout and grow, how roots develop in problem soil, how water moves through different soil types, how cuttings form roots, and so on. Each student needs one clear utility glove, soil, and seeds from five different seed packets (e.g., lettuce, radish, squash, carrots, turnips). Have students use a felt pen to put their name on the top of their glove and to number the fingertips and thumb (1-5). Place soil in each of the fingertips and thumb and plant different seeds in each. Water the soil and hang gloves (open so the seeds get air) in various places (e.g., near window, dark corner, and so on). Water the soil if necessary. Once the seeds have sprouted, plant them in a cup of soil and watch the plants grow.

9. Enjoy a Mexican taste treat. Make camote! (See Supporting Information for origin.) Gather ingredients and supplies and have students wash their hands and the working surface before handling the food items. Utensils: two saucepans, mixing spoons, measuring cups and spoons, mixing bowl, can opener, hot plate or stove, 9" x 13" pan, and blender. Ingredients: one 20-oz. can of crushed pineapple, 1-lb. can of sweet potatoes, 4 cups of granulated sugar, and 1/2 cup of powdered sugar.

   - Open the can of pineapple and empty the contents into a saucepan. Cook over medium heat about 10 minutes, or until pineapple is tender.
   - Remove the pineapple from the heat and cool slightly. Pour into a blender and blend on high for a few seconds. Pour mixture into a mixing bowl.
   - Open the can of sweet potatoes and puree the contents in the blender.
   - Pour the pureed sweet potatoes into a saucepan and heat thoroughly over medium heat for about 5 minutes. Stir in the granulated sugar and simmer for 5 minutes.
   - Remove mixture from heat. Cool slightly.
   - Add the sweet potato mixture to the pineapple and stir to mix. Pour the blended mixture into a greased 9" x 13" pan and allow to set up for 34-36 hours.
   - When mixture is firm enough to unmold, divide into small portions and roll each into a finger-like shape. Refrigerate. Roll the shapes in powdered sugar before serving.

10. Make artful root prints. Use the roots, bulbs, and tubers left from stations or use a new collection. Slice some roots or carve a "stamp design" in the cut surface of a potato half. Brush root surfaces with tempera paint and apply them to construction paper with a press-and-lift motion. Repeat or overlap with various colors and roots or carvings to create pleasing designs. Let dry. Frame and display in a Root Gallery.

11. Consider taking a class hike to determine what plant parts and species in your area you might be able to eat, if you were a hunter-gatherer, and what you might consider growing, if you were an early horticulturist. Do some research to see whether your community has a resource person to serve as a specialist for such an activity, and remind students never to eat anything unfamiliar.

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Weaver, William Woys. *100 Vegetables and Where They Came From*. 2000. ISBN: 1565122380.

MUSIC

State of Oklahoma. *Sandy Land*. Folk song.

EDUCATOR'S NOTES

ROUTE TO ROOTS

Station signs and directions: Remind students they are each responsible for recording their answers, observations, and results in their notebook or science journal and on the ***Root Drawings*** sheet.

Station 1: What keeps me in place?

Materials: 1 moist, potted seedling

Procedure: Gently dump out or cut away the pot to remove the seedling intact. Carefully loosen the soil around the roots and brush it away to reveal the roots. Point out the plant parts you see.

Questions

1. What plant parts do you see that you can name?

2. Describe the roots. Where do they grow? How do the roots help hold such a plant in place?

3. Why is this important?

4. In which direction do roots grow with regard to light and water?

5. Describe and draw the roots and soil.

Station 2: Where do the water and minerals go?

Materials: Bowl with 1 cup of water
Paper towel (brown is best)
1/2 teaspoon of salt

Procedure A: Stir 1/2 teaspoon of salt into the water until you cannot see it. Have one student put his or her finger into the water, taste it, and describe the taste to others. Save the bowl of water and salt for Procedure B.

Questions

1. What has happened to the salt?

2. What does the water taste like?

Procedure B: Roll and twist the paper towel like a root. Dip the tip in the bowl of water. Describe what happens. (When finished, clean the bowl for the next group.)

Questions

1. If roots absorb water like a paper towel, where does the water go?

2. Can the salt in the water be absorbed through plant roots? If so, how?

3. Why is it important that roots can absorb water and other things?

Station 3: Can I really hold you?

Materials: 1 mature potted plant (with holes in bottom of pot)
1 pot (with holes in the bottom) of soil with no plants (Soil may need to be refilled after each group.)
2 bowls
2 cups of water (one cup for each pot)
1 paper towel

Procedure: Set the pots in the bowls. Write a guess or prediction of what will happen to the water as it is poured into each pot. Then pour the cup of water into each pot. Let the water drain into the bowls for two minutes.

Describe and compare the amount and color of the water and the contents in the water in each bowl. When finished, drain the water in each bowl through a paper towel. Describe what and how much is left on each paper towel. Clean the bowl for the next group.

Questions
1. How do the results for both pots compare with your guess or prediction?

2. What conclusion can you make about roots holding soil in place?

3. Why is this important?

4. Erosion is the wearing away and loss of soil by wind or water. How do plant roots help prevent soil erosion?

Station 4: Are we all alike?

Materials: 1 ***Root Drawings*** sheet per student
Root samples from four plants (include at least one taproot and one fibrous-root sample)
Magnifying glass or hand lens

Procedure: On your ***Root Drawings*** sheet, draw what each plant's roots look like. Use a magnifying glass or hand lens to see details and draw what you see in the circles.

Questions: The questions are on your ***Root Drawings*** sheet.

Station 5: Which part is which?

Materials: Drawing materials for each person
Examples of root foods, including the entire plant if possible; or reference books (encyclopedias, dictionaries, the Internet, science textbooks) in which you have noted good photos of such plants

Procedure: Choose one of the roots people eat as food. Draw and color its complete plant including root, stem, leaves, flowers, seeds, and any other distinguishing parts. Label each part. Use an encyclopedia, dictionary, the Internet, or science book as a reference to learn what the plant parts look like.

Questions

1. Why is each part of the plant important?

2. What are at least five ways in which roots are valuable to people, animals and the environment?

Station 6: How can I make a new me?

Materials: Small piece of sweet potato with an "eye" (whole sweet potato if done as whole-class demonstration)
4-6 toothpicks per sweet potato, marker, masking tape
Clear plastic cup
Water

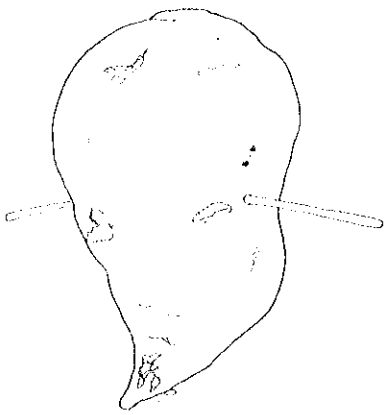
Procedure: Push toothpicks into the sweet potato as shown in the drawing below and add water to the cup to set up your investigation. Label your group's cup (or your own cup, if everyone grows their own) with a marker and piece of tape. Place in a sunny spot or on a windowsill and write observations about it (growth rate, height, color, size, and number of leaves) during the next two to three weeks.

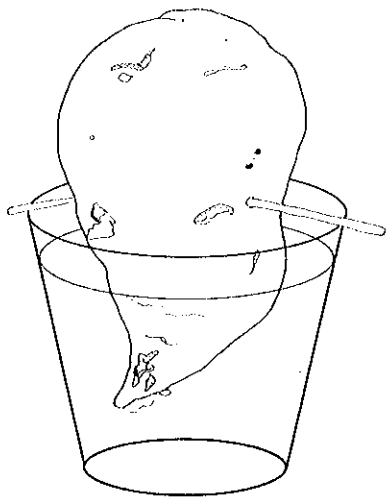
Questions

1. What do you think will happen?

2. Describe what you see happening during the next two weeks by drawing what you see and writing about it.

3. How might some roots grow into new plants?





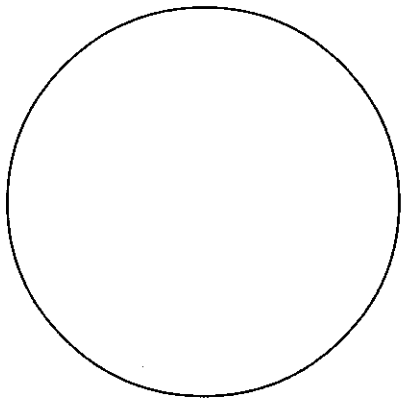
ROOT DRAWINGS

Name:_____

Some plants have one main, long root called a taproot. Taproots have many smaller roots, which are called root hairs. Some plants have many roots all about the same size. These branching root systems are called fibrous roots. Taproots and fibrous roots can store food. The more food stored, the fatter the root.

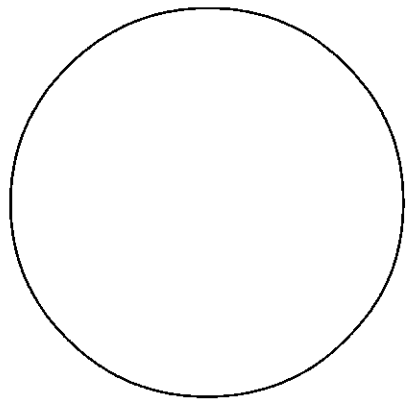
Directions: Draw the roots of each of the plants you examine with a magnifying glass or hand lens. Label each plant's roots as "tap" or "fibrous."

Plant 1 has _____ root(s)



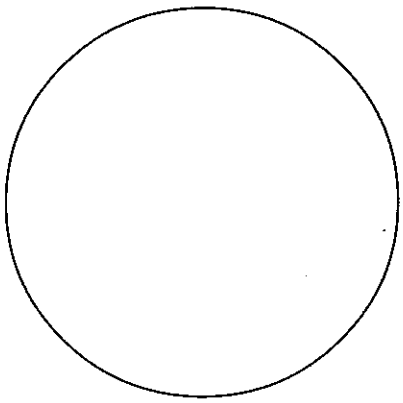
Magnified View

Plant 2 has _____ root(s)



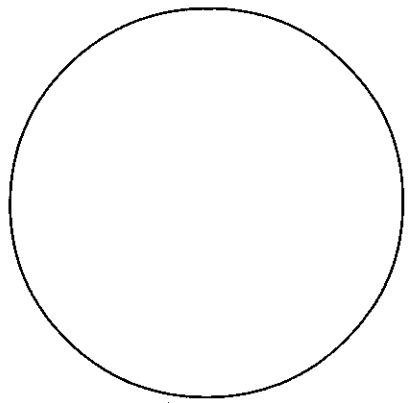
Magnified View

Plant 3 has _____ root(s)



Magnified View

Plant 4 has _____ root(s)



Magnified View

Questions: (Answer on the back if necessary.)

1. How are the roots of these plants alike?
2. Why might they be alike?
3. How are the roots different?
4. Why might they differ?
5. Which type of root would you eat and why?

ROUTE TO ROOTS STATION ANSWERS

Station 1

1. What plant parts do you see that you can name? *(stems, roots, flowers, leaves)*

2. Describe the roots. Where do they grow? How do the roots help hold such a plant in place? *(Roots of most plants grow in the ground. They help hold plants in place by forming a network that clings to the soil. The root itself grips the soil and the root hairs grow in the spaces between the particles of soil. When the plant is pulled, the root hairs get "stuck" in these spaces, making it harder to pull up the plant.)*

3. Why is this important? (Accept reasonable answers, but guide students to see that roots help hold soil in place against the forces of wind, water, and ice that might move it away.)

4. In which direction do roots grow with regard to light and water? *(Roots grow away from light and into places where water is available, usually downward. The force of gravity is the signal roots use to orient downward.)*

Station 2

Procedure A

1. What has happened to the salt? *(The salt is dissolved in the water.)*

2. What does the water taste like? *(It tastes salty.)*

Procedure B

1. If roots absorb water like a paper towel, where does the water go? *(Water moves up the root into the stems and leaves of the plant.)*

2. Can the salt in the water be absorbed through plant roots? If so, how? *(Yes, as the salt is dissolved. It is similar to how plants get dissolved minerals from soil and water through their roots.)*

3. Why is it important that roots can absorb water and other things? *(Roots provide the rest of the plant with water and water-dissolved minerals that plants need for nourishment and growth.)*

Station 3

1. How do the results for both pots compare with your prediction? (Accept reasonable answers.)

2. What conclusion can you make about roots holding soil in place? *(There will usually be less water in the bowl under the potted plant and the water will be clearer. This shows how plant roots help hold soil in place.)*

3. Why is this important? (Accept reasonable answers.)

4. Erosion is the wearing away and loss of soil by wind or water. How do plant roots help prevent soil erosion? *(Plants help prevent soil erosion by holding soil in place against the forces of wind, water, and ice.)*

ROUTE TO ROOTS STATION ANSWERS (page 2)

Station 4

Answers for questions 1, 3, and 4 on the ***Root Drawings*** sheet will vary according to the kinds of roots used as samples.

1. How are the roots of these plants alike?

2. Why might they be alike? *(Accept logical answers for the similarities in roots. Some likenesses include functions: they are all roots which move water and nutrients to the plant and they anchor plants, hold soil, and store nutrients. Students also will comment on appearance.)*

3. How are the roots different? (Accept reasonable answers.)

4. Why might they differ? *(Accept logical answers for the differences in roots. There are many reasons why roots are not all the same. Larger, heavier plants need larger root systems. Plants in dryer climates may need very deep roots or very spread-out roots to reach the moisture they need. Some roots need plenty of room to grow. Others are crowded for space and fill every little crack they can find.)*

5. Which type of root would you eat and why? *(There are no right or wrong answers; taproots, however, store the most food.)*

Station 5

1. Why is each part of the plant important? *(Roots hold the plant in the soil so wind and water can't carry it away, and they absorb water and nutrients from the soil. Stems support the leaves and flowers of the plant and carry water and nutrients from the roots to other parts of the plant. Leaves gather sunlight and make food for the rest of the plant through photosynthesis. Flowers contain pollen and attract pollinators, which is important in fertilization and the production of seeds or fruit. Seeds will grow new plants, since they contain a plant embryo and the food it needs to get started.)*

2. What are at least five ways in which roots are valuable to people, animals and the environment? (Answers will vary, but might include:
   - *People eat roots and the plants that grow from roots.*
   - *Animals eat roots.*
   - *Roots help prevent soil erosion.*
   - *Roots hold plants in place.*
   - *Roots can be used to grow new plants.*
   - *Old roots decay, returning nutrients to the soil to nurture other plants.)*

Station 6

1. What do you think will happen?

2. Describe what you see happening during the next two weeks by drawing what you see and writing about it.

3. How might some roots grow into new plants? *(When students closely examine the sweet potato — a root — they will see small indentations or "eyes." These are actually the beginnings of tiny buds which under the right conditions will produce sprouts that grow into plants. Sweet potatoes will first grow roots and then leaves in a few weeks to become a new plant. When a piece of sweet potato with an eye [farmers call these "seed potatoes"] is planted, the starch in this seed potato "feeds" the plant until its leaves are mature enough to photosynthesize and produce its own nutrients. If you dig up your young sweet potato plants in two or three weeks, you'll find stems and leaves emerging from the sweet potato sprouts and thread-like roots growing from their base.)*

I know of no pursuit in which more real and important services can be rendered to any country than by improving its agriculture...

George Washington (1732-1799),
July 20, 1794

Florida Agriculture Quiz

1. Agriculture is Florida's second leading industry.
   TRUE FALSE

2. Florida farmers and ranchers produce _____ different crops and livestock products.
   120 280 380

3. Florida dairies produced _____ pounds of milk in 2005.
   15.8 million 712.3 million 2.27 billion

4. List the leading importers of Florida agriculture commodities.

5. The average size of Florida farm is _____ acres.
   115 235 480

6. Florida plans a total of _____ million trees each year.
   67 82 112

7. According to government statistics, there are approximately _____ farms in Florida.
   21,750 42,500 58,000

8. Agriculture directly and indirectly contributes over _____ billion dollars to Florida's economy.
   23 62 87

9. The three major categories for aquaculture production are tropical fish, aquatic plants and _____.
   clams shrimp oysters

10. List five of the commodities that Florida ranks first in the Nation.

Florida Agriculture Quiz Answers

1. Agriculture is Florida's second leading industry.
   TRUE FALSE

2. Florida farmers and ranchers produce _____ different crops and livestock products.
   120 *280* 380

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   15.8 million 712.3 million 2.27 billion

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   Canada The Netherlands
   Japan United Arab Emirates
5. The average size of Florida farm is _____ acres.
   115 *235* 480

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   21,750 *42,500* 58,000

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9. The three major categories for aquaculture production are tropical fish, aquatic plants and _____.
   clams shrimp oysters

10. List five of the commodities that Florida ranks first in the Nation.
    Oranges Grapefruit Tangerines Sugarcane
    Snap beans Tomatoes Cucumbers Bell peppers
    Squash Watermelon

Florida Ag in the Classroom Resource Guide

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Ace of Hearts Ranch
http://www.aceofheartsranch.com

Ag Day
http://www.agday.org/

Agriculture in the Classroom-USDA
http://www.agclassroom.org/

Ag in the Classroom Kids Zone
http://www.agclassroom.org/kids/index.htm

Florida Farm Bureau
http://www.floridafarmbureau.org

Florida FFA Association
http://www.flaffa.org

Florida Nursery, Growers and Landscape Association
http://www.fngla.org

Florida Strawberry Growers Association
http://www.straw-berry.org/

Green Meadow Farm
http://www.greenmeadowsfarm.com

Harbor Branch Oceanographic Institute
http://www.hboi.edu

Illinois Ag in the Classroom
http://www.agintheclassroom.org

Institute of Food and Agricultural Sciences at the University of Florida
http://www.ifas.ufl.edu

Kansas Foundation for Ag in the Classroom
http://www.ksagintheclassroom.org/

Louisiana Ag in the Classroom
http://www.aitcla.org

Maryland Ag in the Classroom
http://www.maefonline.com/

Moo Milk
http://www.moomilk.com/

National Corn Growers Association
http://www.ncga.com/

National FFA Organization
http://ffa.org

National Pork Producers – Food Fun for Kids
http://www.nppc.org

National Watermelon Promotion Board
http://www.watermelon.org

New Hampshire Ag in the Classroom
http://www.pubpages.unh.edu/~pcj/aitc.html

Oklahoma Ag in the Classroom
http://www.clover.okstate.edu/fourh/aitc/

Pennsylvania Ag in the Classroom
http://www.cas.psu.edu/docs/CASPROF/agclassroom/agclassroom.html

Planet Ag
http://www.fl-ag.com/PlanetAg/

Project Food, Land & People
http://www.foodlandpeople.org

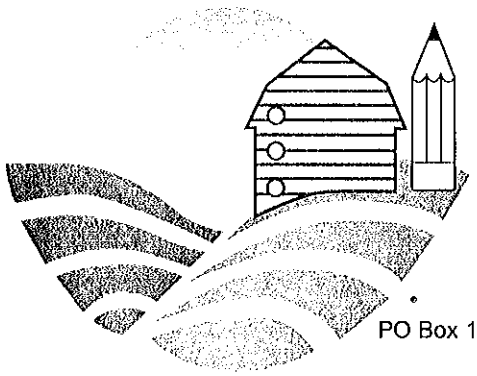
Space Agriculture in the Classroom
http://www.spaceag.org/

Utah Ag in the Classroom
http://www.ext.usu.edu/aitc/

Vrrrooommm 4-Citrus Farming for Kids
http://www.farmkidvid.com

Wyoming Ag in the Classroom
http://www/wyomingagclassroom.org

Zip 4 Tweens
http://www.zip4tweens.com



Florida Agriculture in the Classroom, Inc.

AGRICULTURE KEEPS FLORIDA GREEN

PO Box 110015, Gainesville FL 32611 (352)846-1391 FAX (352)846-1390
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FOR IMMEDIATE RELEASE
JAN. 5, 2009

FLORIDA AGRICULTURE IN THE CLASSROOM FUNDS
36 TEACHER GRANTS ACROSS FLORIDA

GAINESVILLE – More than 7,200 students around Florida will learn about using sugarcane byproducts as an alternative fuel, agriculture water use and growing Florida vegetables, among other projects, as part of the 36 teacher grants Florida Agriculture in the Classroom, Inc. is funding for the 2008-09 school year.

The non-profit, Gainesville-based organization will provide more than $29,000 for these projects. Florida Agriculture in the Classroom is funded solely by sales of the agriculture specialty license plate also known as the 'Ag Tag.'

"Supporting the grant projects of teachers who want to teach their students about Florida agriculture is one way Florida Ag in the Classroom educates teachers and students about the industry," said Cara Martin, chairman of Florida Agriculture in the Classroom and assistant director of government and community affairs for Florida Farm Bureau.

"These teacher grant projects will reach a broad range of grade levels from pre-kindergarten to 12th grade and disciplines with agriculture-related lessons in language arts, math, science and social studies," Martin said.

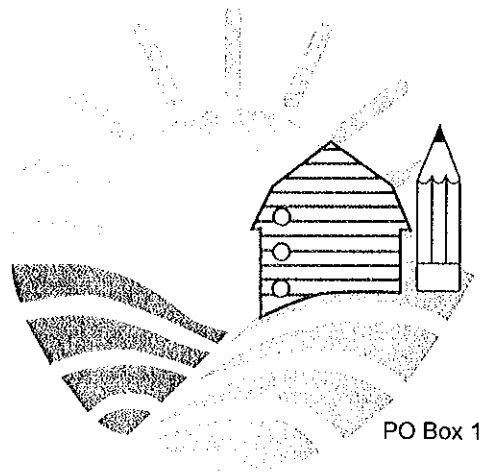
The teacher grant projects approved are as follows:

1. **"Croppin' Kindergarteners"** – Kindergarteners at Micanopy Area Cooperative School in Alachua County will learn about vegetable farming in Florida by planting raised bed and Earth Box gardens.
2. **"Discovering Florida: Our Land, Our Food, Our People 2008-09"** – First through fifth grade students at Archer Community School in Alachua County will learn about turn-of-the-century farming in Florida and man's dependence on natural resources to grow crops.
3. **"Passion" Ate About Learning"** – Pre-kindergarten through fifth grade students at Endeavor Elementary Magnet School of Technology in Brevard County will learn about the Florida agriculture industry by planting Earth Box gardens.
4. **"Children Grow Together"** – Seventh graders at New Renaissance Middle School in Broward County will learn about Florida commodities and the impacts of starvation and distribution of wealth in poor countries by sending the proceeds of products grown in their schoolyard garden to Nambia in Africa.

5. **"Garden Buddies"** – Second graders at McNab Elementary in Broward County will learn about Florida commodities and nutrition by planting a garden and participating in hands-on activities.
6. **"Gardenology: A Living Laboratory"** – Tenth, eleventh and twelfth graders at South Plantation High School in Broward County will learn about environmental science, botany and Florida agriculture in a land laboratory they will create.
7. **"Plan"ting for the Future"** – At-risk students in ninth through twelfth grade at Blountstown High School in Calhoun County will learn about healthy eating using Florida commodities.
8. **"Cow Days"** – First graders at Pine Meadow Elementary in Escambia County will learn about the Florida dairy industry and where milk and dairy products come from in this classroom agriculture project.
9. **"Raising Cane in Florida"** – Students at Matanzas High School in Flagler County will learn about the Florida sugarcane industry and the decisions involved in using alternative fuel made from ethanol, sugarcane and other agriculture byproducts.
10. **"Container Gardening with Food Crops"** – Sixth graders at Gulf Coast Academy of Science and Technology in Hernando County will learn about the Florida vegetable industry by growing vegetables in Earth Boxes.
11. **"Farming in Water"** – Sixth graders at West Hernando Middle School will learn about fish farming and hydroponics by raising tilapia in a fish tank and growing strawberries hydroponically.
12. **"Which Came First: The Chicken or the Egg"** – Kindergarteners and second graders at Symmes Elementary in Hillsborough County will learn about the Florida agriculture industry using a virtual farm and operating an incubator to hatch chicks.
13. **"The Art Club Serenity Garden"** – Kindergarten through fifth grade students at Beachland Elementary in Indian River County will learn about Florida horticulture and herb production by expanding a schoolyard garden.
14. **"BEE Earth Smart"** – Third graders at Umatilla Elementary in Lake County will learn about bees and their importance to the Florida agriculture industry from a guest speaker and Florida Agriculture in the Classroom lessons.
15. **"From the Garden to Table"** – First graders at Clermont Elementary in Lake County will create real-life connections to their science, math, reading and writing lessons by growing edible plants in container gardens.
16. **"Harvesting Water"** – Pre-kindergarten through third grade students at Astatula Elementary in Lake County will learn about Florida agriculture and its need for water by irrigating their schoolyard garden with rain collected in barrels.
17. **"Horticulture for Healing: The Outdoor Living Classroom"** – Special needs students in the third, fourth and fifth grade at Lake Hills School in Lake County will learn about beneficial insects and the plant life cycle by establishing a butterfly garden.
18. **"ESE Classroom Garden"** – Special needs students in ninth through twelfth grade at Liberty County High School learn about Florida agriculture by planting commodities in Earth Boxes.
19. **"How Does Your Garden Grow?"** – Kindergarteners at Liberty Early Learning Center in Liberty County will learn where their food comes from by planting a container garden and listening to an agriculture industry speaker.
20. **"Palma Sola's Earthbox Research, Square-Foot Gardening and Hydroponics Growing Project Within the Reader's Workshop** – Third graders at Palma Sola Elementary in Manatee County will learn how plants grow using different growing systems, what beneficial insects' role is in plant production and how their Florida ancestors grew and processed food.
21. **"Agriculture's ABC's"** – Inner city students in first through fifth grade at Lillie C. Evans Elementary in Dade County will learn where their food comes from by planting a raised bed garden.
22. **"Sponge Bob's Square Plots"** – Third graders at John I. Smith Elementary in Dade County will learn about Florida agriculture by planting a square-foot garden and participating in Florida Agriculture in the Classroom and other lessons.

23. **"We're Growin' and Growing"** – Students in pre-kindergarten, first grade and second grade at South Miami K-8 Center will learn about agriculture production in the Miami-Dade County area by growing plants that mirror commodities grown in the area.
24. **"It's Elemental: The Chemistry of Farming"** – Students in kindergarten through fifth grade at Moss Park Elementary in Orange County will learn about the elements and nutrients that plants and animals need to survive by studying the Periodic Table, soil composition and the Florida phosphate industry.
25. **"Fifth Grade Embryology Project"** – Fifth graders at Sacred Heart Inter Parochial School in Pinellas County will learn about Florida agriculture by rearing chicks in a classroom incubator and participating in Florida Agriculture in the Classroom lessons.
26. **"St. Raphael's Garden Angels"** – Students in kindergarten through fifth grade at St. Raphael Catholic School in Pinellas County will learn about the Florida agriculture industry by planting a schoolyard vegetable garden and participating in Florida Agriculture in the Classroom lessons.
27. **"Florida Agriculture Quilt"** – Fourth graders at Indian Rocks Christian School in Pinellas County will learn about the Florida agriculture industry by making a quilt with 67 squares featuring images of commodities produced in each county.
28. **"Going Green"** – Students in kindergarten through seventh grade at Grace Lutheran School in Polk County will learn about Florida flower and vegetable production by planting a schoolyard garden.
29. **"Butterflies and Botany"** – Students in kindergarten through second grade at Bartow Elementary Academy in Polk County will learn about Florida agriculture by making a shade house into a plant lab for agricultural experiments.
30. **"Environmentally Friendly Gardening and School"** – Students in pre-kindergarten through eighth grade at St. Paul Lutheran School in Polk County will learn about producing food and the nutrients required by expanding their hydroponics garden and experimenting with composting and vermi composting projects.
31. **"From Seed to Pancake!"** – Second graders at South Woods Elementary in St. Johns County will learn about the challenges farmers face and where grains come from by planting a garden, the products of which will be used to make pancakes.
32. **"Earth Quilt and Butterflies"** – Students in kindergarten through fifth grade at Wildwood Elementary in Sumter County will learn about Florida agriculture by planting an Earth Quilt Garden in which students from different grade levels oversee different parts of the garden.
33. **"Teaching ESE Youth Life Skills through Agriculture Education"** – Special needs students in ninth, tenth, eleventh and twelfth grade at Taylor County High School will learn about Florida agriculture by planting a schoolyard produce garden.
34. **"It's Fun to Find Out about Food"** – Pre-kindergarten students at Suwannee Primary School will learn how food travels from the farm to the table by participating in Florida Ag in the Classroom lessons and activities and observing a classroom greenhouse.
35. **"F.A.R.M.: Florida Agriculture Really Matters"** – Students in kindergarten through fifth grade at Manatee Cove Elementary in Volusia County will learn about the Florida horticulture industry by planting a native plant garden.
36. **"Plant InvestiGators"** – Second graders at Kate M. Smith Elementary in Washington County will learn about plant science and local commodity production by participating in hands on experiments and Florida Agriculture in the Classroom lessons.

FOR MORE INFORMATION, CONTACT LISA GASKALLA BY CALLING (352) 846-1391 OR EMAILING gaskalla@ufl.edu



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Florida Agriculture in the Classroom, Inc. 2009-10 Teacher Grants

Statement of Intent

Florida Agriculture in the Classroom, Inc.'s Teacher Grant program strives to fund classroom projects that teach Florida school children about the importance of agriculture and introduce them to agricultural producers and representatives in their areas.

Timeline *

Proposals due to the FAITC office ... Oct. 1, 2009
Announcement of awards ... October or November 2009 by mail
Progress report due to the FAITC office, and all funds encumbered ... Dec. 11, 2009
Final report due to the FAITC office ... April 30, 2010

Eligible Applicants**

Certified Florida teachers engaged in classroom instruction at the kindergarten through 12th grade levels who integrate agricultural concepts into non-agricultural curricula.

Due to the fact that Agri-Science teachers are already familiar with agriculture, and represent a large portion of Florida Agriculture in the Classroom's Volunteer base they are eligible for funding through the Volunteer Grant Program which is available first of the year.

Grant Requirements

- Agricultural concepts must be used.
- Students must be directly involved.
- The use of Florida Agriculture in the Classroom curricula and/or materials must be demonstrated in the application and in the final report. If the use of Florida Agriculture in the Classroom materials is not included in the application, it will be disqualified.

- At least one local farmer or agriculture industry representative must be involved in the project in some way as a classroom speaker, project helper or sponsor.
- Teachers must give students involved in the grant project pre- and post-tests, and include the results of these tests in the final report.
- Community involvement in the project is encouraged, and a list of in-kind contributions from the community should be listed in the application.
- A detailed budget with estimated expenses listed in spreadsheet form must be included in the application.

Funding Guidelines

- Transportation will only be considered in situations where there is a justifiable need.
- Grant money can not be used for consumables unless the food items are an integral part of the lesson plan and the end product.
- Grant checks not cashed within 60 days after receipt will become null and void.
- Half of the money is paid up front and the other half is paid when the Progress Report is submitted. A Final Report must be submitted by the deadline or future grant requests automatically will be denied.
- Grant checks will be made payable to the school, not to an individual.

Judging Criteria

Points	Criteria
25	Ability to increase student understanding of Florida agriculture
25	Planned program approach to integrating agricultural concepts in the classroom.
20	Creativity, innovation and ability to address issues of concern to Florida agriculture
10	Extent of use of Florida Ag in the Classroom curricula and materials (Keeping Florida Green and Project Food, Land and People)
5	Detailed budget and budget justification
5	Time line and logistics

Management and Reporting

- Brief (less than one page) summary of project progress is due on or before Dec. 11, 2009.
- Florida Agriculture in the Classroom must receive copies of all related materials in a printable format.

- The final report must include original receipts and documentation of expenses in spreadsheet form.
- The final report should include the number of students the project actually reached and the results of the pre- and post-tests. Please include photos.
- The final report is due by April 30, 2010. Afterward, any developments with the project should be submitted in a letter at the end of the school year.
- Failure to comply with these reporting requirements will result in the automatic removal of the teacher from consideration for future grant requests.

Format for Proposals

1. Must be typed on 8 ½ inch by 11 inch white paper, doubled spaced and in 12-point type. (Proposals can be typed directly on the application provided or that form can be duplicated in a word processing program.)
2. Limited to the two-page application form, which will provide a thorough explanation of implementation of the project and evaluation plans.
3. Include an attachment detailing the project's budget, and in-kind contributions.
4. Include an attachment with a time line.
5. Include a title page that lists the project's name and the contact person's name, address, phone number and email address.
6. Include a letter of support from a school administrator.
7. Submit five copies of the proposal. Failure to submit the required number of copies will result in automatic disqualification.

Proposal Submission

The deadline for submitting grant proposals to the Florida Agriculture in the Classroom office is Oct. 1, 2009. (Proposals must be postmarked on or before Oct. 1, 2009.)

Completed proposals should be mailed to:

Florida Agriculture in the Classroom
P.O. Box 110015
Gainesville, FL 32611
Attention: Lisa Gaskalla

Please send overnight deliveries to:
Florida Agriculture in the Classroom
University of Florida
Building 440 Mowry Road
Gainesville, FL 32611

Questions:
Contact Lisa Gaskalla by calling (352) 846-1391, emailing gaskalla@ufl.edu or visiting www.agtag.org

Florida Agriculture in the Classroom, Inc. Materials Order Form

Qty _____ ***Keeping Florida Green*** - grades 6 through 8; interdisciplinary; correlated to the Sunshine State Standards; hands-on activities.
Free of charge for Florida teachers and volunteers who complete training workshops All others in Florida $13/book, $2/CD.

Qty _____ ***Project Food, Land & People Resources for Learning*** - grades Pre-K through 12; correlated to the Sunshine State Standards;
hands-on activities; agricultural/environmental, interdisciplinary lessons. *Free of charge to teachers and volunteers who complete*
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Qty _____ ***The Honey Files: A Bee's Life*** - grades 4 through 6; Set includes 20-minute video and 96-page guide to information, classroom
activities and worksheets about bees, honey and pollination. *$5/set.*

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Qty unavailable ***Gardening for Grades*** - grades Pre-K through 8; how-to information for teachers to educate students about using school gardens.
Includes resource lists of books and web sites related to gardening. *Distributed free of charge to Florida teachers and volunteers.*

Qty _____ ***What's the Buzz on Bees?*** - grades K-5; correlated to the Sunshine State standards. Four lessons on CD allows students to
follow Bissy Bee as she teaches them about honey bees from their biology to pollination, and introduces them to her grumpy
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Qty _____ ***Growing Space I and III*** - grades 6 through 8; educational magazines highlighting agricultural applications of research
conducted during space missions. *Distributed free of charge to Florida teachers and volunteers (1 per student/40 per class).*

Qty _____ ***The Science of Milk*** - grades 6 through 8; a teacher's guide with creative ideas for labs using milk and/or dairy products.
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Qty_____ ***Florida Agriculture Activity Newspapers*** – Discovering Florida's Growing Treasures, grades K-2, Growing up Healthy with
Food from Florida, grades 3-5, The Science and Technology of Florida Agriculture, grades 3-5, Life From the Land: Past,
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Qty _____ ***Living on the Edge in Florida*** – grades 9 through 12; correlated to Sunshine State standards; educational CD and teacher's guide
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"Good Fire" and "Bad Fire." Set includes a CD and teacher's guide. *Distributed free of charge to Florida teachers and*
volunteers (1 per classroom – limited time only).

- At least one local farmer or agriculture industry representative must be involved in the project in some way as a classroom speaker, project helper or sponsor.
- Teachers must give students involved in the grant project pre- and post-tests, and include the results of these tests in the final report.
- Community involvement in the project is encouraged, and a list of in-kind contributions from the community should be listed in the application.
- A detailed budget with estimated expenses listed in spreadsheet form must be included in the application.

Funding Guidelines

- Transportation will only be considered in situations where there is a justifiable need.
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Qty _____ ***Growing a Nation: The Story of America Agriculture*** – grades 6 through 12; interactive multimedia CD-ROM that links to online teacher resources and complements existing American history textbooks and high school history curricula; CD includes agricultural innovations, research and inventions that have changed the lives of all Americans, their culture, economy and quality of life. *Distributed free of charge to Florida teachers and volunteers (1 per classroom, limited time only).*

Qty _____ ***Living Science Food, Agricultural and Natural Resources Careers*** – grades 6 through 12; educational packet outlining 40 available careers in food, agriculture and natural resources. *Distributed free of charge to Florida teachers and volunteers (1 per classroom – limited time only.)*

Total $_____

Name_____ School/Organization _____

Grade(s)_____ Subject(s) Taught _____

Address _____City_____ _____, FL

Zip _____County _____Telephone (_____)_____ Fax (_____)_____Email _____

Please return this form to: Florida Ag in the Classroom, Inc., PO Box 110015, Gainesville, FL 32611. Phone: (352)846-1391, Fax: (352)846-1390; or email your order to faitc@.ifas.ufl.edu .Visit our web site at www.agtag.org for online order form. Revised 9/09

FLORIDA AG IN THE CLASSROOM, INC.
2009-10 Teacher Grant Application Form

Title of Project:

School name:

Contact person:

Contact address:

Contact phone: ( )

Amount requested: $

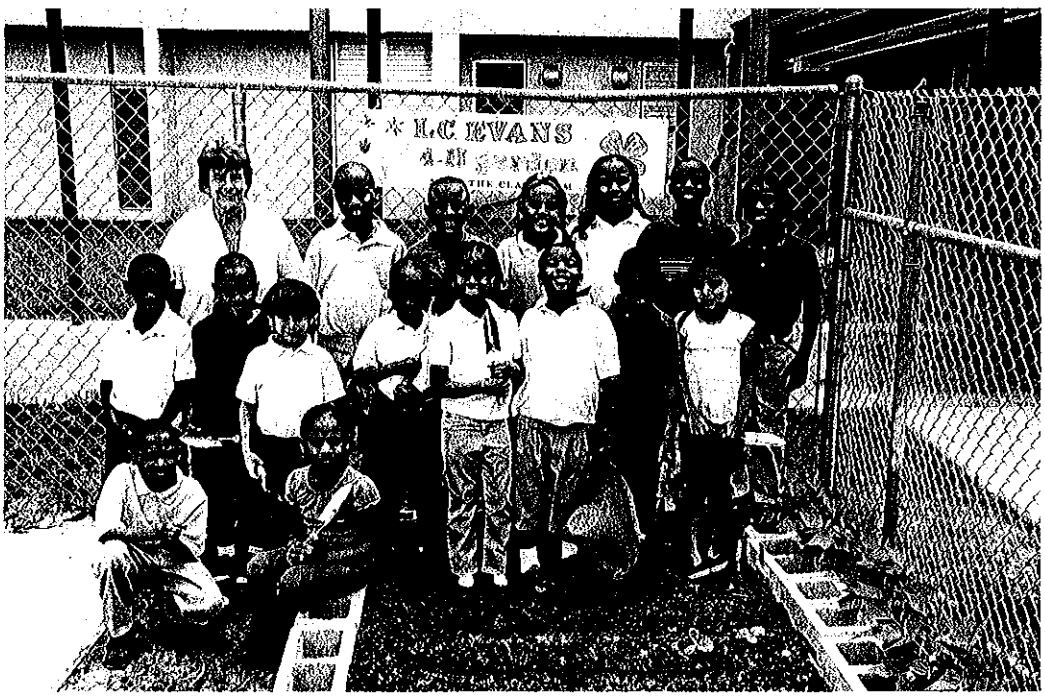
Purpose of project:

Description of project:

Academic subjects utilized:

a. Describe the major Sunshine State Standards that will be incorporated in this project:

b. Describe the Florida Ag in the Classroom curricula and materials to be used:


L.C. EVANS

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THE EDUCATION FUND
FOR EXCELLENCE IN MIAMI-DADE PUBLIC SCHOOLS

IMPACT II
ADAPTER APPLICATION

Presented by
BankAtlantic
Florida's Most Convenient Bank

Use this form to get "seed" funding to ADAPT an idea

APPLYING FOR AN IMPACT II ADAPTER GRANT

A teacher seeking to become part of the IMPACT II network as an ADAPTER chooses one of the curriculum ideas profiled in past or this year's *IDEAS with Impact* catalogs and creatively modifies it to their own classroom. (For a list of past years' ideas, contact Lorna Valle, 305-892-5099, x18 or visit www.eductionfund.org).

Adapter Grant awards average $200. *To apply, you must contact the teacher who developed the idea before submitting your application.* Contact can be made by attending a workshop given by the disseminator, communicating via e-mail or telephone, by visiting the disseminator in their classroom, or by having the disseminator visit your classroom. Project funds must be spent within the current school year or an extension must be requested. A final report and expense form with receipts are required. Periodic site visits may be conducted.

Deadline: November 3

1. GENERAL INFORMATION (Please TYPE. All information must be completed for consideration.)

A. Name: _____ **B.** School: _____

School Address: _____ City/State: _____ Zip Code: _____

School Phone: _____ School Fax: _____

C. Home Address: _____ City/State: _____ Zip Code: _____

Home Phone: _____ E-mail: _____

2. PROJECT INFORMATION

A. Title of Project (as it appears in the Idea catalog): _____ Catalog Year: _____

B. Name of Project disseminator(s): _____

C. You are REQUIRED to make direct contact with the disseminator(s) of the project you are interested in adapting BEFORE a grant can be approved.

I made contact via: ☐ Workshop/EXPO ☐ Telephone ☐ Visit ☐ Letter/E-mail
☐ Other (Please specify): _____

If no contact was made, please state why: _____

3. IMPLEMENTATION INFORMATION

A. Who are the students involved in your adaptation? How many? _____ Grade level(s)? _____

Ethnic distribution? _____ Achievement levels? _____

B. How will it help low-performing students in your classroom? _____

_____

Apply online at www.educationfund.org.

C. What is the educational need for this project in your class? (Use one additional page if necessary.)

D. How will you implement the project with your students and integrate it with your curriculum? What changes will be made from the original project ideas? Will you be adapting the project to fit with a current theme or event? (Use ONE additional page if necessary.)

E. May IMPACT II staff and teachers visit your class with prior approval? ☐ Yes ☐ No

F. Are you willing to help the disseminator network this idea? ☐ Yes ☐ No

4. BUDGET INFORMATION

A. What materials are needed to adapt this project to your class? *Be specific.* (Use ONE additional page if necessary.)

Item and Description	Cost	Source of funds (this grant, school funds, other)

TOTAL REQUESTED $ _____

5. COMMUNITY AND SCHOOL RESOURCES

A. What other persons, if any, will be involved in implementing this project? (e.g. teachers, specialists, library media specialists, para-professionals, parents, other volunteers)

B. What other resources does your school have to assist in adapting this project? (e.g. library materials, equipment, instructional materials, community agencies)

6. ADMINISTRATIVE SUPPORT (TO BE COMPLETED BY SCHOOL PRINCIPAL)

I support implementation of this project during this school year. ☐ Yes ☐ No

Principal's Comments:

Applicant's Signature _____ Principal's Signature _____ Date _____

Deadline for application is **November 3rd.** Send an original, typed application and **four** copies with **four** self-addressed mailing labels to:

The Education Fund, 900 NE 125th St., Suite 110, North Miami, FL 33161

This application may be photocopied to distribute to other educators.

Apply online at www.educationfund.org.
(Application on IMPACT II page.)

Apply online at www.educationfund.org.

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Ford | Lincoln | Mercury

Gold Star

BankAtlantic
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