Elementary Science: Scientific Investigation and Classification

A collection of hands-on lessons and activities for the elementary classroom incorporating scientific investigation and classification as well as the scientific method.

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Turn Apples into Applesauce

Content Area
Science: K1, 1.1, 2.1
English: K8, 1.13, 2.3
Math: K13, 1.14, 2.17

Objective
Students will: Using senses, investigate how heat changes apples into applesauce; record time apples become soft; put data into bar graph; write a paragraph using complete sentences and new vocabulary words to explain the process; organize process steps in correct order.

Materials
- Two pounds or about five apples (yields 3 cups sauce) from a baking variety like Empire, Gala or Golden Delicious
- Knife (adult)
- Cutting board
- Lemon juice or acidic acid
- Either a hot plate and heat proof dish (will take about 1.5 hours to complete) or crock pot to heat apples until soft (will take about 4 hours on High)
- Spoon
- Kitchen timer or stop watch
- Fork (or food mill or sieve if finer texture is desired)
- Vocabulary Words-copies for each student
- Time Chart- copies for each student
- Bar Graph-copies for each student

Background Knowledge

One bushel of apples weighs about 48 pounds.
An average of 5-6 million bushels of apples are produced annually by Virginia growers.

Virginia apple growers produce many popular varieties including Red Delicious, Golden Delicious, Rome, Stayman, Gala, Winesap, York, Granny Smith, Jonathan, Fuji and Ginger Gold.

The majority of apples trees are grown in the Shenandoah Valley.

Seventy percent of Virginia apples are sold for processing and made into popular products such as applesauce, apple juice, apple butter, slices and cider.

An average apple contains only 80 calories. Apples have five grams of fiber, 20% of the daily recommended fiber needs. Potassium, which is found in apples, is important in regulating blood pressure.

Apples have no fat, cholesterol or sodium.

Applesauce is a fat free substitute when cooking and can be used in place of oil or shortening. In addition to being healthy, applesauce makes baked goods taste moist.

Procedure

1. Peel, core and chop each apple into 1-inch cubes (adult). Save one apple quarter and leave whole. Discuss the safety of using a knife. Discuss whether the bigger piece of apple will make any difference in the time it takes to cook the apple to the soft stage.
2. Give each child one apple cube. Compare the color, smell, taste, and texture of the raw apple.
3. Discuss the vocabulary words and their meanings.
4. Put two raw apple cubes on plate. Dip only one in lemon juice or acidic acid. Compare the two as the color changes and talk about oxidation.
5. Put the raw apple cubes (including the whole quarter) and 1 cup water and cook over medium heat. Cover with lid. Note the time on the chart.
6. Set the timer or stop watch to check the apples every 10 minutes and stir. Add more water if needed to keep apples moist and from sticking to pan. Note the time on chart when the apples are soft and can be easily mashed with fork. Did it take longer for the bigger piece to cook?
7. Mash the cooked apples with a fork. Add sugar if desired. If a finer texture is desired use a food mill or sieve.
8. After the apples are mashed, cool and serve as a nutritious snack.
9. Look at the color, smell, taste and texture of the applesauce. How is it different than the raw apple?
10. Look at the cooking time chart and transfer the figures to the bar graph.
11. Discuss the order of the steps of the experiment and have students number them in order they occurred.
12. Have students write a short paragraph using complete sentences and each of the vocabulary words to describe the experiment.

Extension

1. Investigate a second variety that is best eaten raw, like Red Delicious. Compare to a cooking variety like Fuji. Select two pounds (about 5) of apples (yields 3 cups sauce). Cook at the same time as the cooking variety. Use the same type of heat source for a constant. Compare the color, smell, taste, and texture of both varieties at timed intervals. Record on chart. Make a bar graph for each and compare results. Did one variety cook quicker than the other variety?

2. Using the same time chart, make apple butter in crock pot and record the time. Discuss the length of time it takes to make applesauce vs. apple butter. Compare color, smell, taste, and texture of applesauce to apple butter. Use words like more, less, darker, lighter, longer, and shorter.

3. Read a story about Johnny Appleseed.

Recipe for Applesauce

2 pounds (about 5) cooking apples
1 1/2 cups water
Sugar to taste (optional) (about ¼ cup)

Wash, core and peel apples. Cut into 1-inch cubes. Add apples and water to pan and cover with lid. Cook over medium heat until water boils. Reduce heat to low and cook apples until are soft. On electric heat, process will take about one and half hours. In a slow cooker, process will take about 4 hours. More water may be added to keep apples from sticking and bottom of pan moist. Mash with a fork or press through sieve or food mill.

Recipe for Apple Butter in Slow Cooker
Cook Time –Total time 8 hrs

Slow Cooker- At least 5 quart cooker

Ingredients
8 cups cooking apples, peeled, thin-sliced
2 cups granulated white sugar
1/4 teaspoon ground cinnamon
1/8 teaspoon ground cloves
1/8 teaspoon salt

Directions:

1. Stir all ingredients in slow cooker. Cover; cook on High for 1 hour and then on Low for 7 hours, or until the apple butter is thick and brown. Stir occasionally throughout the day. Provides a delightful smell in the room.
2. Apple butter will thicken as it cools. Serve on biscuits.
3. Store in refrigerator.

Number the steps in the correct order to make applesauce

_____ Cook apples until soft

_____ Wash, peel, and core apples

_____ Mash apples

_____ Cut apples into one inch cubes

Date:	Apple Variety(for cooking):
Time	Description
	Raw apples put into pan over heat
	Apples are soft and can be mashed
	Total Minutes

Date:	Apple Variety(for eating raw):

Time	Description
	Raw apples put into pan over heat
	Apples are soft and can be mashed
	Total minutes

Bar Graph for Time Data
Minutes to cook 2 apple varieties

Minutes to cook		
120		
90		
80		
70		
60		
50		
40		
30		
20		
10		
0		

Variety 1- Cooking _____

Variety 2- Eating _____

Note: If using slow cooker, time should be changed to allow up to 5 hours for cooking.

Bar Graph for Time Data
Minutes to cook 1 apple variety

Minutes to cook		
120		
90		
80		
70		
60		
50		
40		
30		
20		
10		
0		

Variety 1- Cooking

_____

Note: If using slow cooker, time should be changed to allow up to 5 hours for cooking.

VOCABULARY

Oxidation- Process when oxygen combines with an element, changing the appearance of the element. In this experiment, air combines with the apple and turns it brown.

Fiber- Coarse, indigestible matter that helps the digestion system.

Acid- Sour or sharp in taste. The lemon juice is an acid. It slows oxidation.

Nutrition- provides the body what it needs to grow and stay healthy.

KEY

Number the steps in the correct order to make applesauce

__3__ Cook apples until soft

__1__ Wash, peel, and core apples

__4__ Mash apples

__2__ Cut apples into one inch cubes

Butter Lab

Standards of Learning
Science: K.1, 1.1, 2.1, 3.1, 4.1, 5.1, 5.4

Objective
The student will conduct an experiment to observe the chemical reaction and changes in property as milk is turned into butter.

Materials
- Heavy whipping cream (room temperature)
- Measuring cup or teaspoon
- Marbles
- Small (2oz) baby food jar with lid (or plastic salad dressing container with lid)
- Timer
- Science notebook or recording sheet

Background Knowledge
Milk fresh from the cow has both cream and milk mixed together. The cream is less dense than the milk, so the cream rises to the top where it can be skimmed off. The milk left behind after the cream is skimmed off is called skim or fat-free milk. Whole milk that you might buy in the grocery store is homogenized to keep the milk and cream mixed together.

Butter is a dairy product made when cream is churned to separate the buttermilk from the butterfat. Churning the cream forces the fat globules to slam into one another. If they hit each other with enough force, they will stick together, the fat collection becoming bigger and bigger with each extra globule. After enough churning, the fat globules form a chunk of butter. What remains is a watery liquid with small butter grains floating in it. This is called “buttermilk” and is drained off and saved for other purposes. The butter is pressed and kneaded into a solid mass to remove any remaining pockets of buttermilk or water. Butter remains a solid when refrigerated, but softens to a spreadable consistency at room temperature, and melts to a thin liquid consistency at 32–35 °C.

Procedure
1. Organize students into groups. Provide each group with 2 small jars, one marble, a scale, measuring cup and timer.
2. Each group will begin by measuring 1 ounce (one fluid ounce equals 6 teaspoons) of cream into their jar.
3. After checking to see that the jars are sealed tightly, the groups will start their timers and begin shaking their jars. Group members may take turns shaking and you may want to play music to encourage their movement. While they are shaking remind students to be observing the properties of the contents of their jar. What does it sound and look like at the beginning, middle, and end?
4. The jar’s contents will go through 3 stages – beginning as a liquid, then becoming a solid as the fat and milk solids stick together, lastly the solution will separate into a liquid and a solid, with the butter on the bottom and the buttermilk on top.
5. They should stop their timers and record the time when they have solid butter at the bottom of the jar and buttermilk on top.
6. Next tell them you will be adding a marble to the next trial as an agitator. Have them form hypotheses on whether this will affect the time it takes for the cream to become butter. Repeat the steps above and record their observations and findings.

7. You may choose to provide crackers to taste their freshly made butter.

Extension
Have students compare and contrast how butter was made before modern technology to how butter is made today.

Credit
Lesson adapted from Oklahoma Agriculture in the Classroom.

Classify That Animal

Standards of Learning
Science K.1, K.6, 1.1, 1.5, 3.1, 3.4
English K.1, K.2, K.3, 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.1

Objective
Students will:

- Review concepts and terms associated with classification of animal characteristics
- Work cooperatively with a classmate
- Complete charts according to their animal's characteristics
- Participate in constructing a classroom chart of animals' characteristics

Materials

- Classify Me! worksheet (handout provided)

There are 15 different worksheets provided. Each pair of students should have the same worksheet(s), but a different worksheet than the other students in the class.

- Class charts (handouts provided)

Background Knowledge

This lesson focuses on students' ability to classify common animals according to simple characteristics, such as body coverings, appendages, methods of movement, and habitat. However, not all animals fit the classification characteristics developed by people. Further, it serves as a review of the concepts and terms associated with animals' distinguishing characteristics.

Students will learn that animal body coverings include hair, fur, feathers, scales, and shells. Animal appendages, which are body parts with specific functions, include arms, legs, fins, wings, and tails. Animals may move by walking, crawling, swimming, or flying. Tame animals are those species which have been trained to live and work side by side with people, Wild animals are those species which have not been trained to live and work with people. Some animals live in water and some animals live on land. An animal's home is determined by the animal's physical characteristics.

Procedure

1. Ask the students the following questions in order to review the concepts and terms associated with classification of animal characteristics.
   - What are some body coverings an animal may have?
   - What are some body parts an animal may use to help it move?
   - What are some ways animals move?
   - What is the difference between wild animals and tame animals?
   - Where are two places an animal may live?
2. As the students give the answers to these questions, write the words on the board.
3. Tell students that today they will be using this information to organize animals into groups. This is called *classification*.
4. Organize the students into pairs or groups.
5. Hand each student a Classify Me! worksheet. Each student should get the same worksheet as their partner.
6. Tell the students that they need to look at the name and picture of the animal at the top of their worksheet. They should then place a checkmark in all the boxes that

apply to their animal. For example, a cat would be classified as having fur, legs, walking, tame, and living on land.

7. Tell the students that they should work with their partners to complete their worksheets.
8. After all the students have finished their worksheets, place the class Body Coverings chart on the overhead or draw it on the chalkboard.
9. Ask the students: Who has an animal with hair as its body covering?
10. When these students name their animal, write the animal on the chart.
11. Then ask the students: Who has an animal with fur as its body covering?
12. When these students name the animal, write the animal on the chart.
13. Continue this process for all the columns on the Body Coverings chart.
14. After the class Body Coverings chart is complete, complete the other charts, Body Parts, Movement, Home, and Wild or Tame, with the class in the same manner as the Body Coverings chart.
15. After all the class charts have been completed, go over the information with the students and ask them to check to make sure their animal's classification on the class charts matches that on their worksheets.
16. Ask the students the following questions.
    - Why is an animal's body covering important?
    - Do all animals have the same body covering?
    - What type of body covering do people have?
    - How do an animal's body parts affect its way of moving?
    - How might an animal that lives on land and an animal that lives in the water be different?

Extension

- Ask the students to use the information about their animal to write descriptive sentences. For example: A fish is covered with scales. It has fins. Students can then illustrate their sentences.
- Choose two of the animals and compare and contrast their characteristics.

References

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ColoringBookFun.com. Retrieved from http://coloringbookfun.com/
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First School preschool activities and crafts. Retrieved from, http://www.first-school.ws/

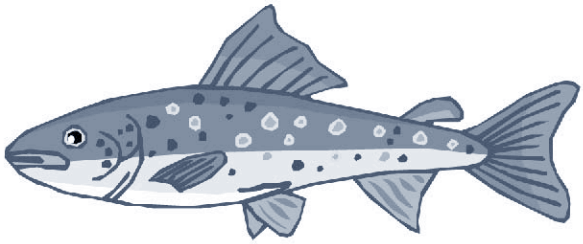
Peterson, C. (1997). *Horsepower: The Wonder of Draft Horses.* Honesdale, PA: Boyds Mills Press. ISBN: 1-56397-943-8
This book is given out to participants at AITC workshops. It can also be found in your school library, you county library or purchased from your favorite bookseller.

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

TROUT



Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

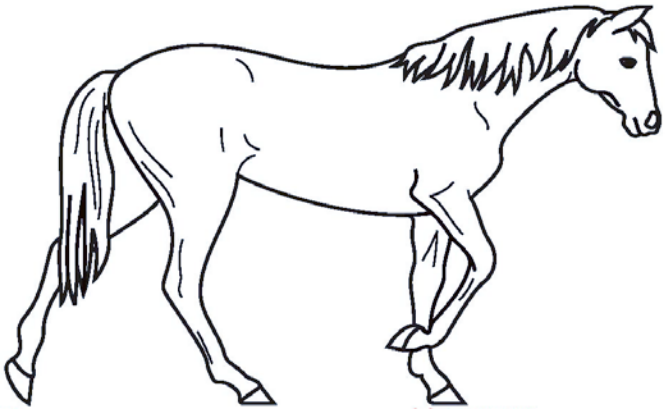
- Wild ☐
- Tame ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

HORSE



Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

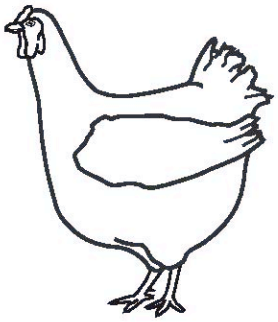
- Wild ☐
- Tame ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

CHICKEN



Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

- Wild ☐
- Tame ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

SQUIRREL

Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

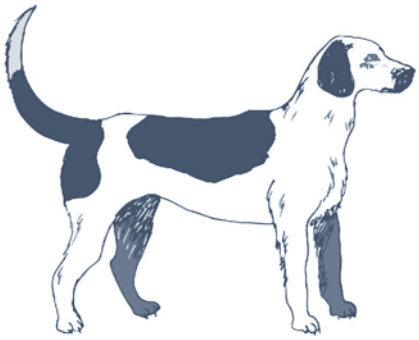
- Wild ☐
- Tame ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

DOG



Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

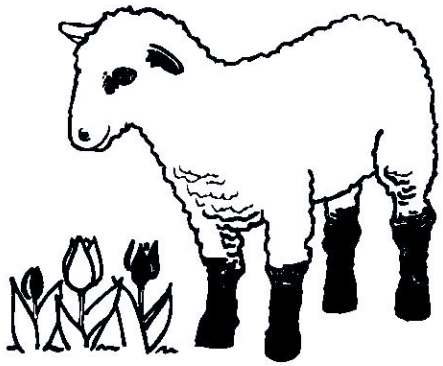
- Wild ☐
- Tame ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

SHEEP



Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

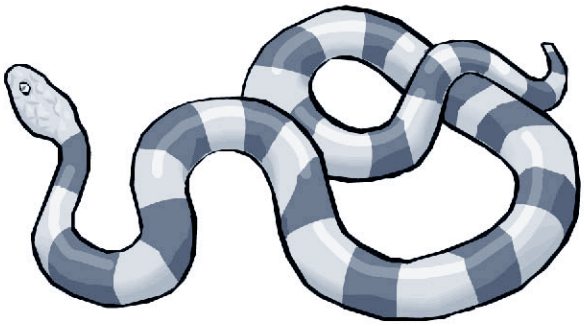
- Wild ☐
- Tame ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

SNAKE



Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

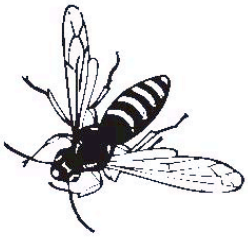
- Wild ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

BEE



Body Coverings

Fur ☐
Feathers ☐
Scales ☐
Shell ☐
Hair ☐

Movement

Crawl ☐
Walk ☐
Swim ☐
Fly ☐

Body Parts

Arms ☐
Legs ☐
Tail ☐
Fins ☐
Wings ☐

Home

Water ☐
Land ☐

Wild/Tame

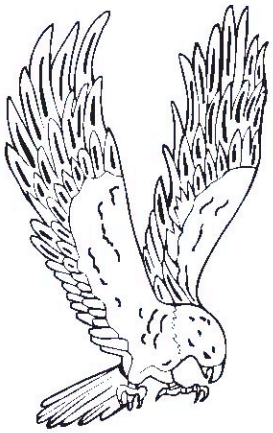
Wild ☐
Tame ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

HAWK



Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

- Wild ☐
- Tame ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

RACOON

Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

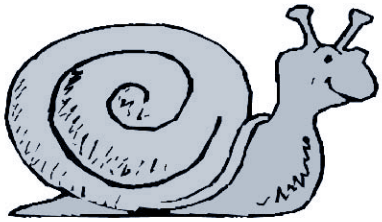
- Wild ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

SNAIL



Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

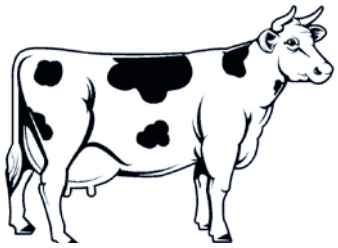
- Wild ☐
- Tame ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

COW



Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

- Wild ☐
- Tame ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

FROG

Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

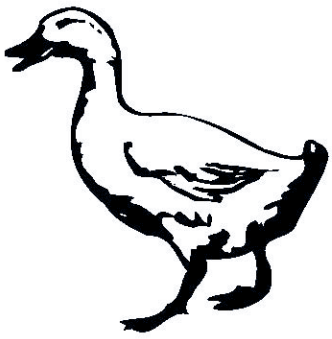
- Wild ☐
- Tame ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

DUCK



Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Water ☐
- Land ☐

Wild/Tame

- Wild ☐
- Tame ☐

Classify Me!

Name: _____ **Date:** _____

Instructions: Check the boxes that best describe the animal seen here.

BUTTERFLY

Body Coverings

- Fur ☐
- Feathers ☐
- Scales ☐
- Shell ☐
- Hair ☐

Movement

- Crawl ☐
- Walk ☐
- Swim ☐
- Fly ☐

Body Parts

- Arms ☐
- Legs ☐
- Tail ☐
- Fins ☐
- Wings ☐

Home

- Land ☐
- Water ☐

Wild/Tame

- Wild ☐
- Tame ☐

Classify Me! Class Chart

Instructions: As a class, fill in this chart using the students' chosen classifications.

Body Coverings

Hair	Fur	Feathers	Scales	Shell

Classify Me! Class Chart

Instructions: As a class, fill in this chart using the students' chosen classifications.

Body Parts

Arms	Legs	Tail	Fins	Wings

Classify Me! Class Chart

Instructions: As a class, fill in this chart using the students' chosen classifications.

Movement

Crawl	Fly	Swim	Walk

Classify Me! Class Chart

Instructions: As a class, fill in this chart using the students' chosen classifications.

Home

Land	Water

Wild or Tame

Wild	Tame

Classifying Living Things

Standards of Learning
Science 2.5, 3.4, 3.5, 4.5, 5.5
English 2.1, 2.2, 3.1, 4.1, 5.1

Objective
Students will:
- Sort living things based on similar characteristics
- Sort living things into kingdoms

Materials
- Pictures of living things found on or near a farm (a set of pictures for each group of 2-4 students)

Background Knowledge
The Five Kingdoms:
1. **Monerans –** microscopic living things made of a single cell with no nucleus
2. **Protists –** microscopic living things made of a single cell with a nucleus
3. **Fungi** – multicellular organisms whose cells have a nucleus; get energy from living things in a state of decomposition
4. **Plants** – multicellular organisms whose cells have a nucleus; trap energy from the sun to make own food through photosynthesis
5. **Animals** – multicellular organisms whose cells have a nucleus; get energy by eating other living things

Procedure
1. Discuss the term "classification."
2. Divide students into groups of 2 - 4.
3. Give each group a set of "living things on a farm" pictures and have them classify them into three different groups. (Ask students to be creative in their criteria for classifying the living things. Classifications can be made based on more than one trait.)
4. Once students have had time to classify the living things, allow them to share their classifications with the class and explain how they classified the living things into those groups.
5. Conclude by sharing with children how scientists classify all living things into five groups.
6. Have the students classify the living things found a farm into the five kingdoms.

Extension
Divide students into small groups and give them three minutes to generate a list of as many living things they can. Classify the living things into the Five Kingdoms.

Ask students to research and discuss the roles that organisms in the different kingdoms play in the environment and how these roles are essential to the agricultural world.

Farmer Ben and Simple Machines

Standards of Learning
Science: 3.2
Language Arts: 3.6

Objective
Students will:
- Read and demonstrate comprehension of a fictional narrative
- Identify simple machines found on the farm

Materials
- Reading comprehension excerpt below

Background Knowledge
There are six basic simple machines, which are tools to help us accomplish tasks easier and more efficiently. The six simple machines are the lever, the pulley, the wheel and axle, the screw, the inclined plane, and the wedge. Farmers use simple machines and complex machines made out of these elements each day to help them do their work around the farm.

Procedure
1. Review the six different types of simple machines and discuss how they help us accomplish tasks each day.
2. Have students read the paragraphs below and underline each of the simple and complex machines.

A Day in the Life of Farmer Ben

Read the paragraphs below and underline each of the simple and complex machines. Then, on a piece of notebook paper list each of the machines that you circled and identify which type of machines was being used.

Farmer Ben woke up before the sun this morning. After a breakfast of scrambled eggs, toast, and juice, he screws the top back on the juice carton and gets ready to begin his day. First, it was time to check the fence around his cattle. He puts his helmet on and hops on his ATV to ride around the farm. Oh no! At the far edge of his farm a tree has fallen on top of the fence. Farmer Ben gets an axe to chop the tree into smaller pieces that can be rolled away in his wheelbarrow. Next, he uses a hammer and nails to fix the fence. By mid-day, it's time to meet Farmer Brown, who is bringing him a new bull. But how will he get the bull out of the trailer? Farmer Ben gets a ramp to help the bull down and leads him to the pasture.

As Farmer Ben walks back towards the house for lunch he sees Farmer Ann working in her garden. She is using a shovel to plant some new flowers. After lunch Farmer Ben readies his tractor to plant corn that the cows will eat. But first, he must tighten the lug nuts on the tire using his wrench. Once the tractor is ready, Farmer Ben climbs into the cab and uses his tablet to check the weather. Then he inputs the coordinates of the corn field so that he can keep track of his crops.

After a long day at work on the farm, Farmer Ben lowers the flag on the flagpole and heads inside for dinner with his family.

Extension

Farmer Ben used various tools to help him do his work. Imagine that you could create a new tool to help make your day easier. What would it be? What would it look like? How would it work? What task would it help you accomplish?

Farmyard Discovery

Standards of Learning
Science: 2.1, 3.1, 4.1
Language Arts: 2.2, 3.4, 4.4
Math: 2.16, 3.14

Objective
Students will:
- Investigate an ecosystem
- Record and describe their findings

Materials
- Large plastic container
- Soil
- small shovels/trowels (you may also use plastic spoons)
- magnifying glasses
- plastic bowls
- ecosystem items
    - Ex: leaves, artificial worms/insects/animals, sticks, pebbles, pine needles
- Recording worksheet, attached (*you may choose to use one or both sides)*

Background Knowledge
The world is made up of a multitude of living things, and in this lesson, students will explore the natural world around them and become more aware of the many plants and animals that inhabit their environment. Schoolyards and gardens, in particular, are ripe for exploration and investigation. Sometimes, however, it is not feasible to take student outdoors to explore, so this lesson offers the option of bringing the outdoors inside. Teachers may choose to do either an outdoor nature walk or an indoor discovery tub.

Procedure
Option A: Nature Walk
1. Pass and go over the Farmyard Discovery recording sheet. Set ground rules for which areas may be explored while outside.
2. Take children outside to find items to fill in their worksheets.
3. Return to the classroom and have students work in partners to complete their worksheets and share their findings with the class.

Option B: Discovery Tub
1. Have your large plastic tub filled with soil and pre-loaded with various items for your ecosystem (see "Materials" for suggestions).
2. Have students take turns in small groups coming up to the discovery tub. Give them a chance to sift through it and see what is hidden.
3. Give each student (or pair) a plastic bowl to fill with items.
4. Have them take the items back to their seats to complete their recording sheets.

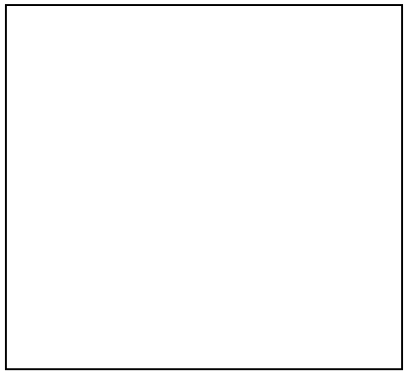
Extension
Use the descriptive words on side 1 of the worksheet to create a farm poem.

Write a synonym for your object *Optional: Find an object that is similar to your original.* _____slick_____	**Draw a picture of your item and write one word to describe it.** EXAMPLE:  _____smooth_____	**Write an antonym for your object.** *Optional: Find an object that has opposite characteristics.* ____rough____
_____	_____	_____
_____	_____	_____
_____	_____	_____

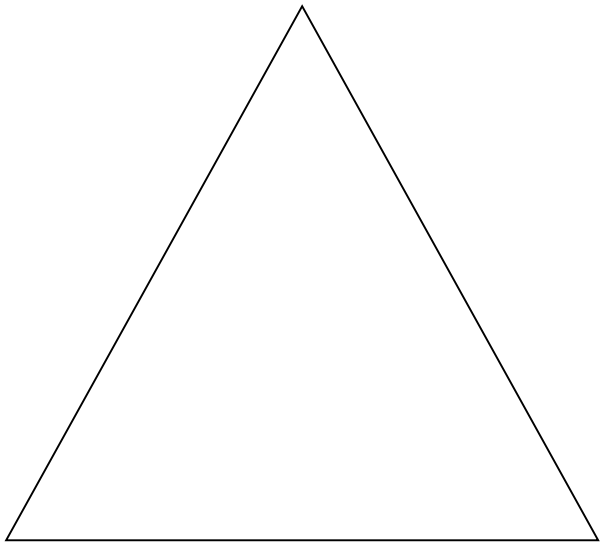
Shape Hunt

Directions: As you walk through the garden, find objects in nature that represent the following shapes and geometric figures. Draw a picture of your object within the shapes below.

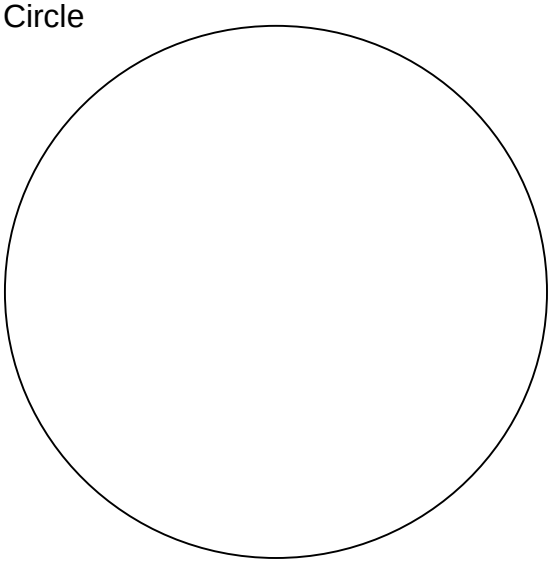
Square



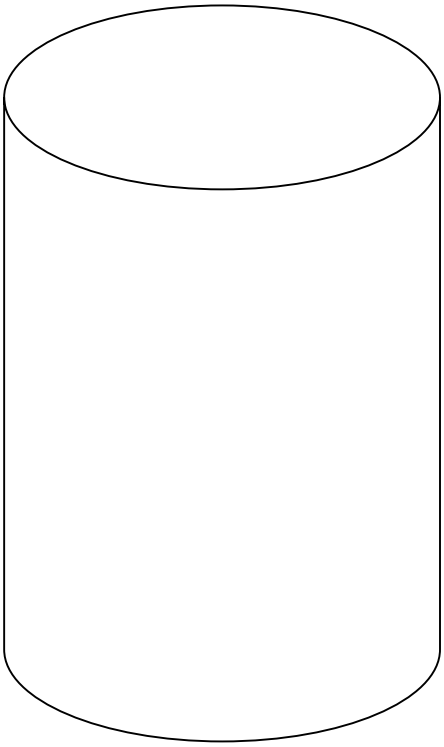
Triangle



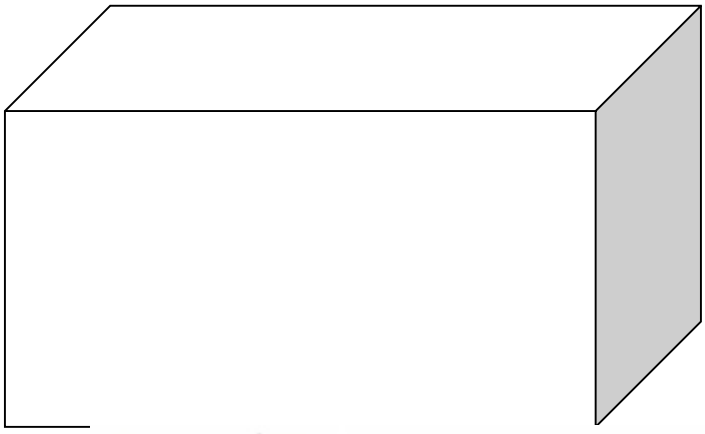
Circle



Cylinder



Rectangular Cube



Garden Opposites

Standards of Learning
Science: K.1, K.2, K.4, 1.1

Objective
The student will be able to:
- use their senses to identify and classify garden objects
- classify a set of objects using physical characteristics

Materials
- 1 egg carton per pair/group, you may choose to cut large (12egg) cartons in half
- classification slips

Background Knowledge
Schoolyards and gardens, in particular, are ripe for exploration and investigation. The world is made up of a multitude of living things, and in this lesson, students will explore the natural world around them and become more aware of the many plants and animals that inhabit their environment.

Prior to this lesson cut out the classification words (attached) and place in the bottom of the egg cartons. Each carton will have just one pair of opposites. They will need to find six examples of these opposite terms.

Procedure
1. Begin by showing students two objects that are opposites (example: a small seed and a large plant; or a hard rock and a soft flower). Ask students to describe the ways in which the objects are different. How do they determine this? Point out that we often use our senses to classify objects.
2. Ask students to brainstorm a list of opposites that may be found outside.
3. Divide students into pairs or groups of 3. Give each group an egg carton.
4. Point out that each row of the egg carton has a word in it. The words lining the two rows are opposites. Instruct students not to tell other groups what words they have.
5. Take the class outside and have them collect objects that match their terms. For example, if one group has "large/small" they will collect 6 (3 if using ½ cartons) large objects and 6 small objects and place them in the appropriate spot in the egg carton.
6. After students have finished collecting, return to the classroom and have groups trade cartons. Challenge students to determine the opposites without looking at the slips.
7. Have groups share their terms and items.
8. Discuss each of the items that were found. Where were they found? What are they? Is it a part of a plant?

Extension
After discussing all of the items that were collected, have students create their own groupings and classifications for them.

This lesson may be differentiated for various grade levels by placing different classification strips in the egg carton. For younger students, you may place a slip of colored construction paper and the student will match an object of the same color. Older students might have decomposers, producers, and consumers. You may also have students create their own labels for classification.

References
Lesson adapted from California Agriculture in the Classroom

rough	smooth
rough	smooth
rough	smooth
hard	soft
hard	soft
hard	soft
dark	light
dark	light
dark	light
wide	thin
wide	thin
wide	thin
heavy	light
heavy	light
heavy	light
small	large
small	large
small	large
bright	dull
bright	dull
bright	dull

Kingdoms on the Farm

Standards of Learning
Science 5.5
Math 5.15

Objective
Students will:
- Classify pictures of organisms into the correct kingdom based on characteristics
- Create a bar graph

Materials
- Five kingdoms review sheet, attached
- Pictures of organisms, attached (you may choose to print as many as you want, so that each student has at least one)
- Farm poster (see sample)
- poster tack
- paper plates, one per student

Background Knowledge
Living things can be classified into five kingdoms: monerans, protists, fungi, plants, and animals. The plant kingdom is divided into vascular and nonvascular plants. Vascular plants have special tissues to transport food and water around the plant. The majority of plants fit in this category. Nonvascular plants do not have special tissues to transport food and water around the plant. The animal kingdom is divided into vertebrates and invertebrates. Vertebrates have a backbone. Invertebrates are cold-blooded and do not have a backbone.

Examples of each of the five kingdoms are readily available on the farm. This lesson includes bacteria, which are microscopic monerans found all over the place. In fact, 1000 bacteria can fit into 1 millimeter. Next are examples of protists – algae may be found on the pond, while amoebas can live in the soil and break down animal waste. Examples of fungi are mushrooms as well as molds or mildew. Crops are susceptible to many diseases caused by fungi. One example is apple scab, which is the most prevalent apple disease for apples on the east coast. The farmer may prevent this disease by treating his orchard with a fungicide. Examples of plants and animals on the farm are plentiful. This lesson uses apple trees and corn as well as pigs, cattle, and a farmer.

Procedure
1. As a review, ask the students to list each of the five kingdoms and then give the characteristics of organisms belonging to each kingdom.
2. After having discussed the first kingdom, put up the review sheet on the overhead and continue with this until all five kingdoms have been discussed.
3. Place the farm poster on the board with all of the pictures attached.
4. Have each student take turns pulling down one of the pictures.
5. When students return to their desks have them stick their picture to one side of a white paper plate. On the other side have them write the kingdom of their organism as well as any other characteristics they can think of.
6. Taking their plates with them, have students line up with the other members of their kingdoms. The lines should run parallel, next to each other.

7. Call on students to identify their organism and tell why they are standing in their particular row. Example: I have bacteria. Bacteria are a moneran because they have a single cell with no nucleus.
8. After you have checked that students are standing in the correct rows, have them place their plates on the ground and step away to form a circle.
9. Point out that they have now created a bar graph with their plates.
10. Ask students to summarize the results of their graph.

Extension

Have students choose a different ecosystem, such as their backyards, the woods, or the schoolyard. Have students draw a picture of their ecosystem including examples of each of the five kingdoms.

Understanding the Five Kingdoms

Kingdom: Monerans

- Microscopic living things
- Made of a single cell
- No nucleus

Kingdom: Protists

- Microscopic living things
- Made of a single cell
- Have a nucleus

Kingdom: Fungi

- Multiple cells
- Cells have a nucleus
- Get energy from living things that are in a state of decomposition

Kingdom: Plants

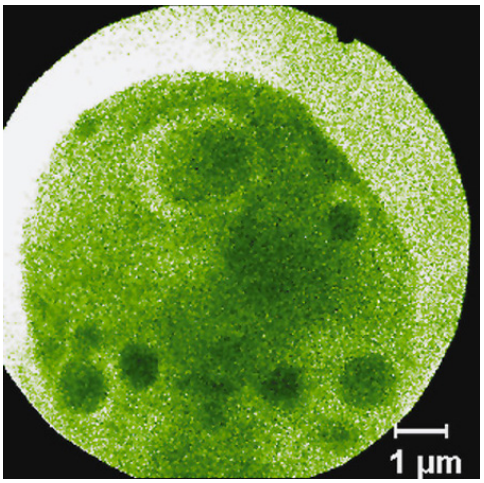
- Multiple cells
- Cells have a nucleus
- Trap light energy from the sun to make its own food through photosynthesis

Kingdom: Animals

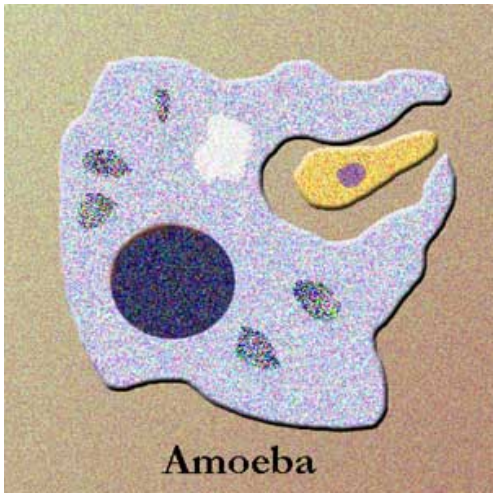
- Multiple cells
- Cells have a nucleus
- Get energy by eating or ingesting other living things

Five Kingdoms on the Farm

Bacteria (moneran)

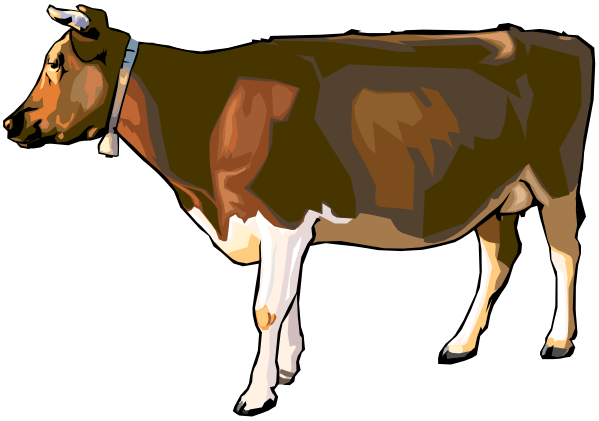


Algae (protist)

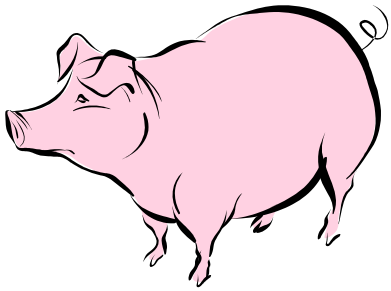


(protist)

Mushrooms (fungi)



cow (animal)

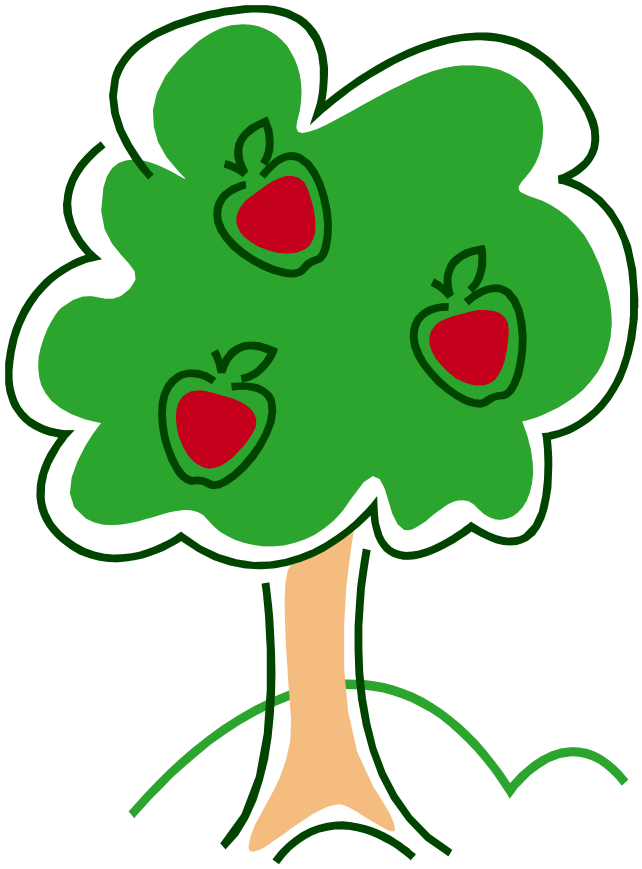


pig (animal)

corn (plant)

apple scab (fungus)

farmer (animal)



apple tree (plant)

My Colorful Food Chain

Standards of Learning
Science 3.1, 3.4, 3.5, 3.10
English 3.1

Objective
Students will:
- Investigate and understand relationships and organisms in food chains (predator/prey; herbivore, carnivore, omnivore)
- Explain the interdependency of plants and animals

Materials
- Farm scene on a poster
- Different organisms (laminated)
- Index cards (one for each student)
- Pencil
- Poster tack

Background Knowledge
This lesson reviews the terms necessary for students to understand food chains and relationships among living things. Students will construct their own "I Am" poem and food chain, given specific organisms to include that relate to Virginia agriculture.

A producer is an organism that makes its own food from sunlight, air, and water. An example is a green plant. A consumer is an animal that eats other living organisms, plant or animal, because they cannot make their own food. Examples are cows, humans, and snakes. There are three different types of consumers. An herbivore is an organism that eats only plants. Examples are geese, butterflies, and goats. A carnivore is an organism that eats only meat. Examples include hawks, snakes, and owls. An omnivore is an organism that eats both plants and animals. Examples include humans, opossums, and foxes. A decomposer is an organism that breaks down decayed plants and animals into smaller pieces that can be used again by living things. Examples are mushrooms and other types of fungi. A predator is an animal that can hunt other animals to get its food. Examples include hawks, owls, and foxes. A prey is an animal that can be hunted by another animal for food. Examples include chickens, mice, and groundhogs.

Every living thing needs energy in order to live. Every time animals do something they use energy to do so. Animals get energy from the food they eat, and all living things get energy from food. Plants use sunlight, water and nutrients to get energy in a process called photosynthesis. Energy is necessary for living beings to grow. A food chain shows how each living thing gets food, and how nutrients and energy are passed from creature to creature. Food chains begin with plant-life, and end with animal-life. Some animals eat plants, some animals eat other animals.

Before beginning the lesson get a large piece poster board and create a farm scene that will depict the different habitats and food chains organisms may fall in. You will want to include sky, pastures, crops, barn, and ponds. You can then cut out the pictures of organisms at the end of

this lesson and laminate them so the students can use them during the lesson. You may want to laminate the poster so you can use it over and over, as well. This landscape should be representative of Virginia agriculture. The students will place the picture of their organism on the farm based on its characteristics.

Procedure

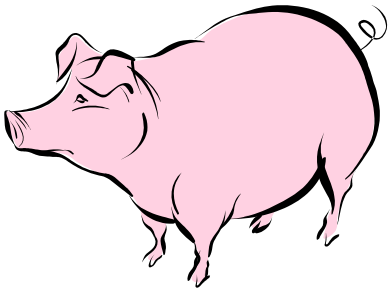
1. Ask the students the following questions:
   a. What is the term for an organism that makes its own food from sunlight, air, and water? Give an example.
   b. What is the term for an organism that eats other living organisms to obtain food? Give an example.
   c. What is the term for an organism that breaks down decayed plants and animals into smaller pieces that can be reused by other living things? Give an example.
   d. What is the difference between an herbivore, a carnivore, and an omnivore?
   e. What are humans classified as?
   f. What is the relationship between a predator and a prey?
   g. What is a food chain and how does it relate to a food web?
2. Hand each student an organism that you have cut out and laminated.
3. Hand each student an index card.
4. Then tell the students to use the index card to write an "I Am" poem about the organism that they have been given. Their poem can include the terms associated with food chains, such as producer, consumer, decomposer, herbivore, carnivore, omnivore, predator, and prey, where they are applicable. Remind students that animals can be classified by more than one of these terms. For example, a rabbit can be a consumer, herbivore, and prey. They may also describe what they eat, where they live, what eats them, and what they look like.
5. After the students have completed their poems, ask them to take turns coming up front to share their poem with the class.
6. After they have shared, attach one piece of poster tack to the back of each student's organism.
7. Have each student come to the farm poster at the front of the class to place their organism in the correct habitat and in the correct order of the food chain. Each student should take into account where the other organisms are placed in order to create a precise food chain.
8. After all the students have discussed and attached their organism pictures, ask each of them to take a look at what they have created and ask them why they placed their organisms where they did.
9. Ask the following questions to review:
   i. What is a food chain?
   ii. How do an organism's needs and characteristics affect a food chain?
   iii. If you changed one organism in the food chain, would the other organisms have to change also?
   iv. Is the habitat your organism and the organisms of your food chain the same as the area in which you live?
   v. If not, how would this affect your food chain?

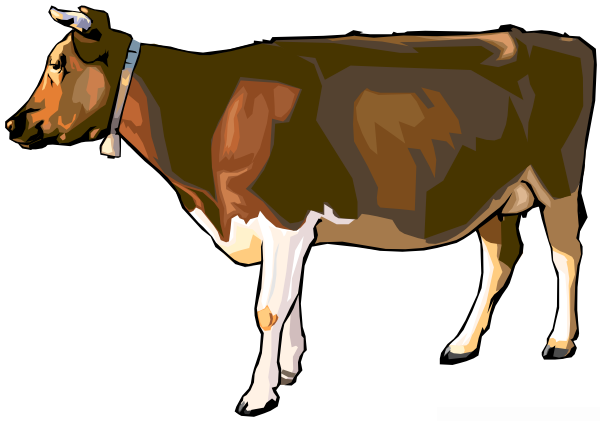
Extension

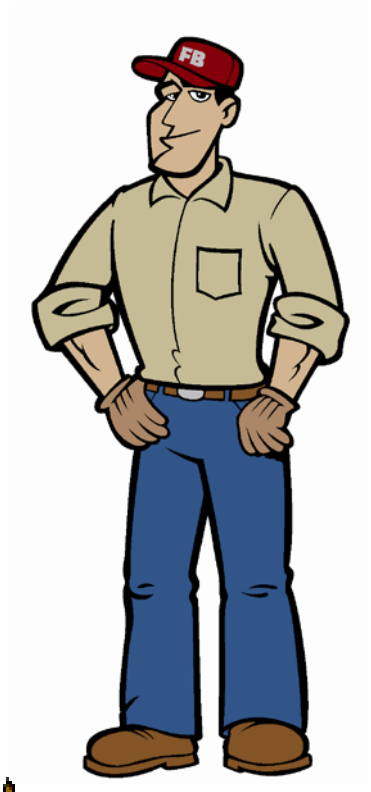
As a class, use the organisms from this activity to create a food web.
Have the students create their own food chains from the animals they have around their house or in their backyard.

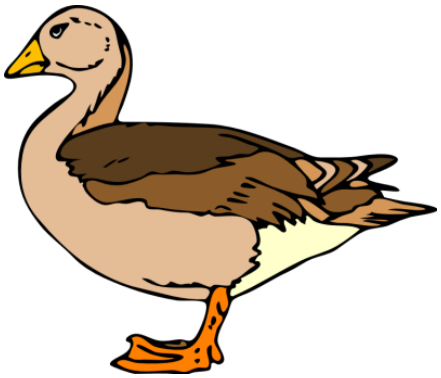
References

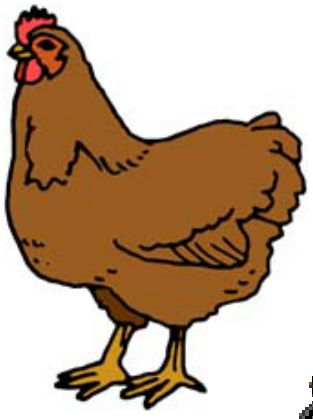
http://www.sheppardsoftware.com/content/animals/kidscorner/foodchain/producersconsumers.htm

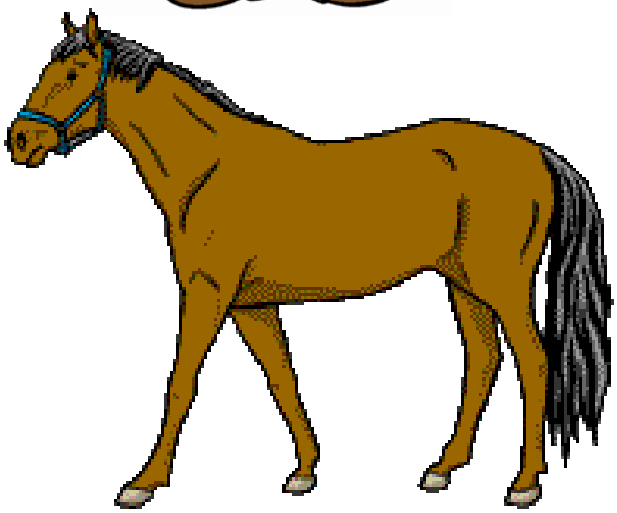


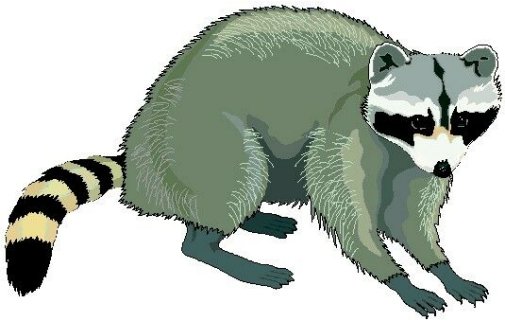


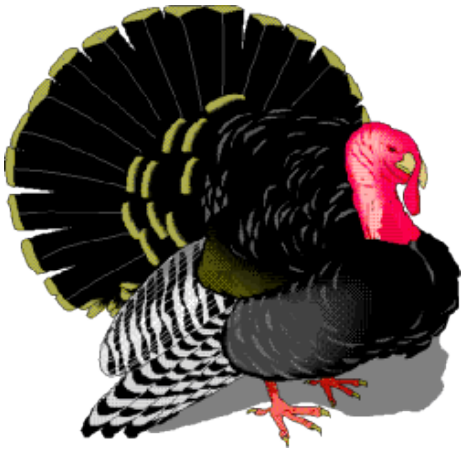


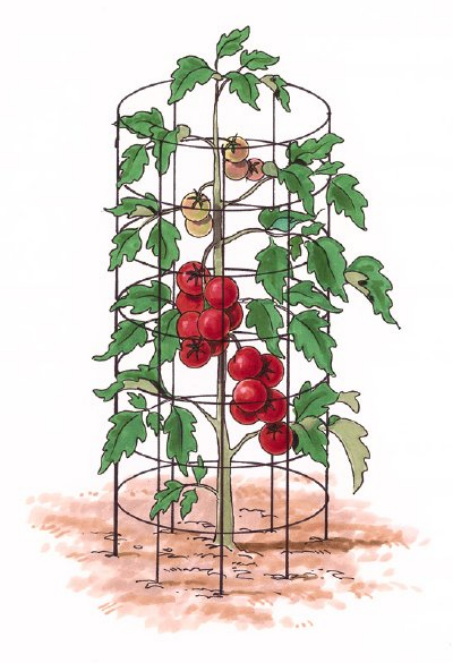


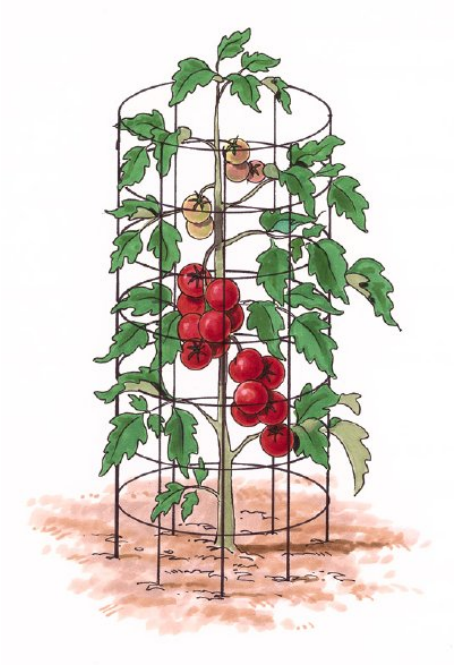












"What's on the Farm?" Classification

Standards of Learning
Various adaptations of the lesson available for the following standards-
Science: K.6, 1.5, 3.5
Social Studies: 2.7

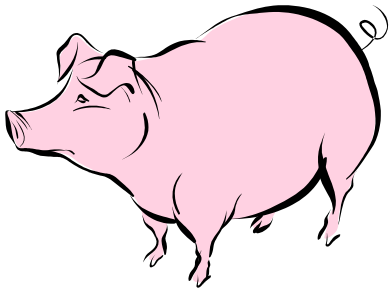
Objective
Students will:
- Sort and classify plants and animals found on the farm

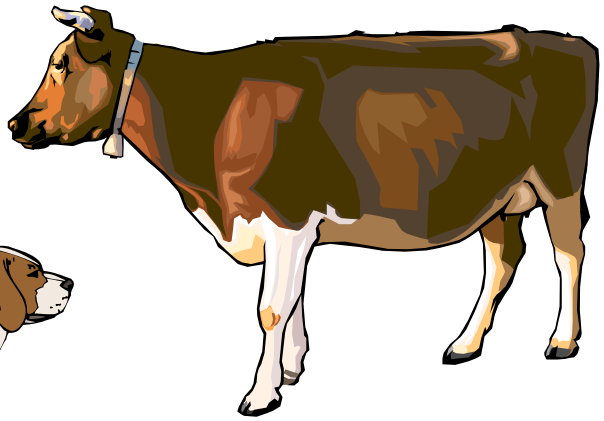
Materials
- Shower curtain with farm scene drawn on it
- Pictures of plants and animals found on a farm, mounted on construction paper/cardstock and laminated
    - *You may download all of AITC's pictures for the lesson on the AITC webpage*

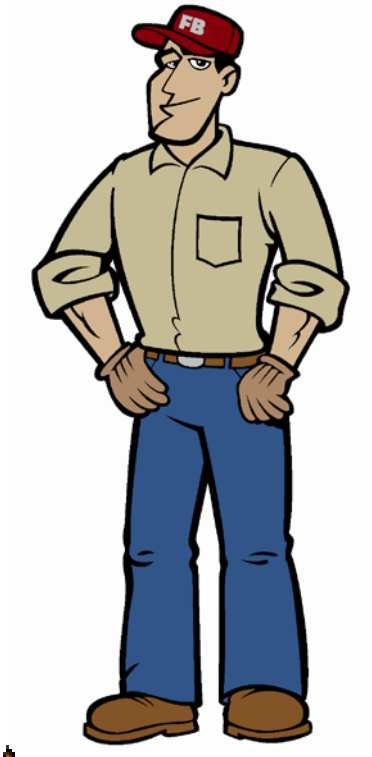
Background Knowledge
Use the farm and its surrounding environment to help students practice sorting and classifying objects. Possible pictures and classifications are:
PK/Kindergarten: living vs. nonliving; plant vs. animal
First Grade: body coverings, animal movement; wild vs. domesticated
Second Grade: natural, human, and capital resources
Third Grade: producers, consumers, and decomposers; predator vs. prey; herbivores, carnivores, and omnivores

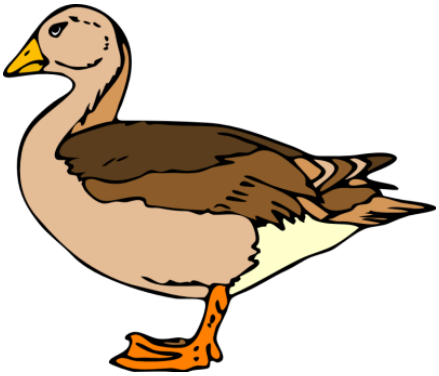
Procedure
1. Prior to beginning the lesson place the farm scene shower curtain on the floor and add all of the plants/animals that you will be using. Refer to the "Background Knowledge" above for guidance on various pictures and classifications to use.
2. Working in teams or pairs have students observe all of the pictures on the shower curtain then have each team collect a picture until the shower curtain is empty.
3. Tell them that you will now sort and classify the pictures that they have. You may choose to have the class brainstorm their own classifications or give them predefined ones.
4. Draw columns and headings on the board for the classification groups. Next have students take turns taping their pictures into the correct column.
5. You may then have students determine other ways to sort the pictures or create a large Venn diagram on the board.

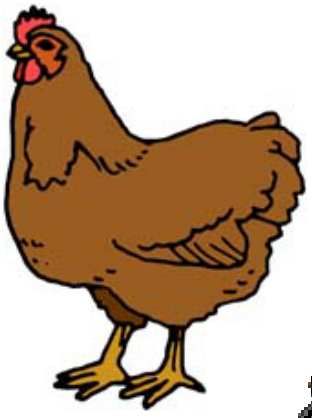
Extension
In addition to sorting pictures, you may also use them to create a food/energy web.

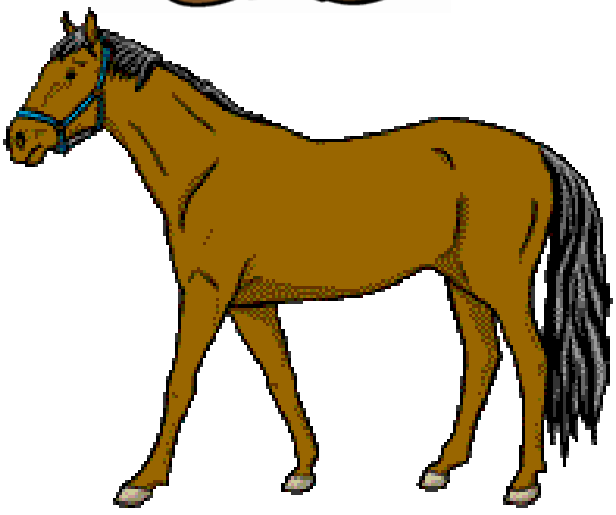


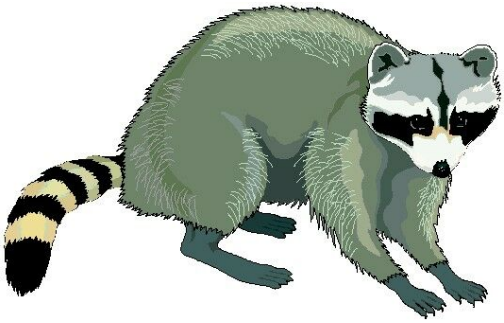


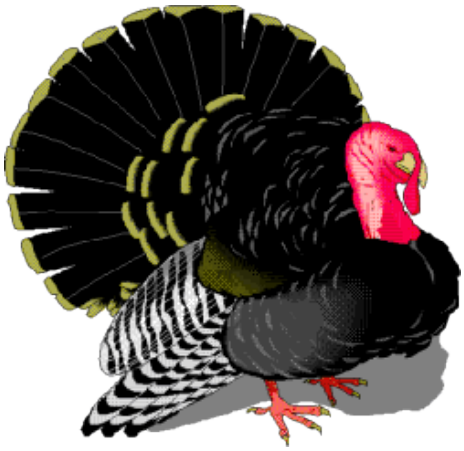

FB









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