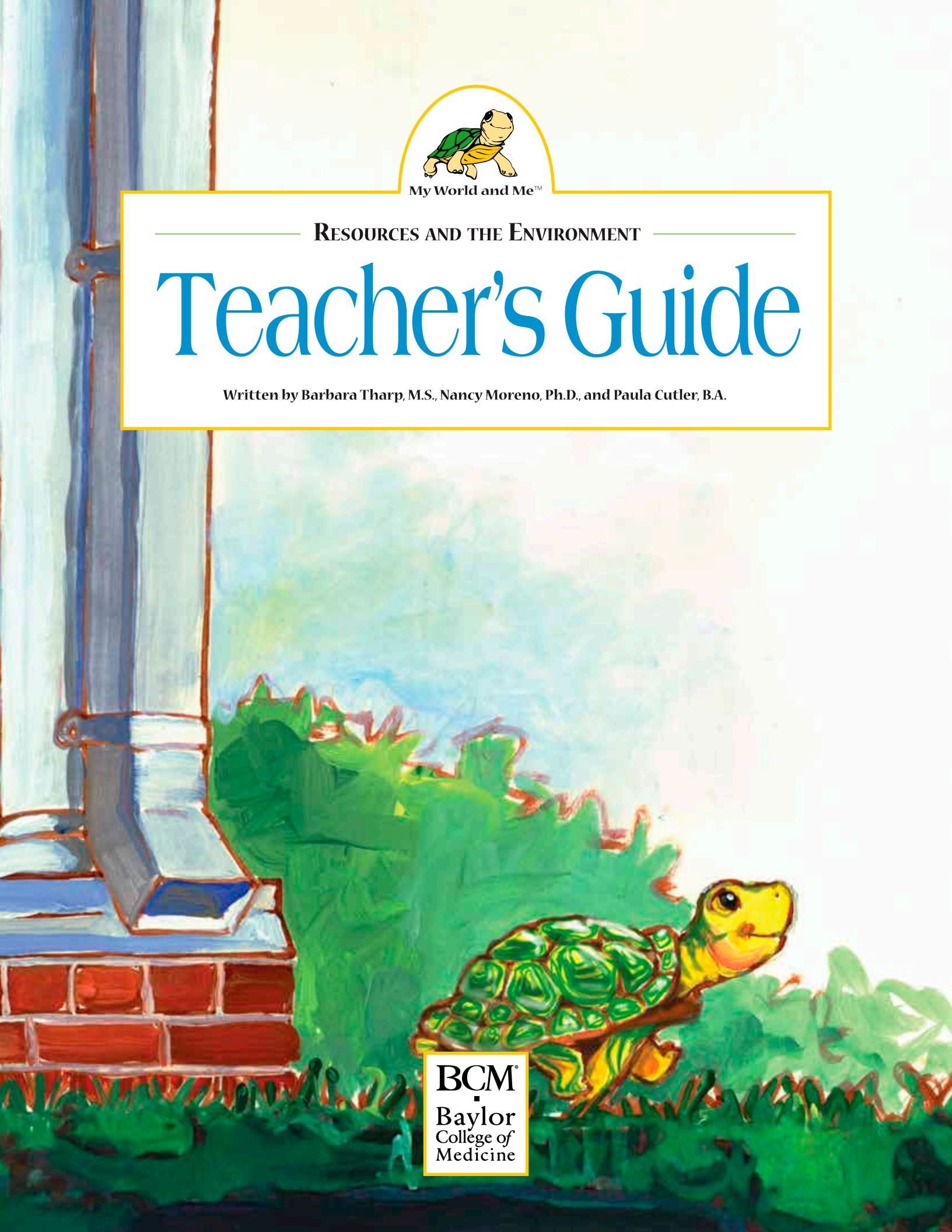

My World and Me™

Resources and the Environment

Teacher's Guide

Written by Barbara Tharp, M.S., Nancy Moreno, Ph.D., and Paula Cutler, B.A.

BCM
Baylor
College of
Medicine

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Contents

My World and Me

This My World and Me *Teacher's Guide* is to be used with the following other components of this unit.

- *Tillena Lou's Big Adventure*
- *The Math Link*
- *The Reading Link*

About My World and Me

The My World and Me Project's integrated educational components link students, teachers and parents to significant knowledge of the environment, life science, physical science and health. Prepared by teams of educators, scientists and health specialists, each My World and Me unit focuses on a different aspect of science and health. The activity-based, discovery-oriented approach of the My World and Me materials is aligned with recommendations of the Next Generation Science Standards (2013) and state standards, such as the Texas Essential Knowledge and Skills (TEKS).

Components of each My World and Me unit help students understand important health and environmental issues.

- *Tillena Lou's Big Adventure* presents the escapades of a little turtle, Tillena Lou, in an illustrated storybook that also teaches science and health concepts related to resources and environments.
- *Resources and the Environment Teacher's Guide* presents activity-based lessons that entice students to discover concepts in science, mathematics and health through hands-on, guided inquiry activities.
- *The Reading Link* provides language arts lessons related to the story.
- *The Math Link* connects the story and hands-on science activities with mathemetics skill-building exercises.

My World and Me materials offer flexibility and versatility, and are adaptable to a variety of teaching and learning styles.

These educational materials engage students and help them to acquire knowledge and skills recommended by the Next Generation Science Standards. For your convenience, a chart has been included in this guide, detailing how the unit helps develop science, mathematics and language arts (and reading) skills.

To facilitate management of your science classroom, this My World and Me guide provides a "Word Bank" of vocabulary used in this unit (see sidebar, page 1), and badges for students to wear when they work in cooperative groups (see page viii). We recommend that students rotate cooperative group job assignments for different activities, so that each student will have an opportunity to experience all roles.

Also included is a template, "My Science Journal," (see page 34), to make copies for student use.

RELATED TEACHING UNIT

Find a related unit, entitled "Living Things and Their Needs," on BioEd Online.

The "Living Things and Their Needs" unit lets students learn about basic survival needs of human beings and other organisms, what plants need to grow, the difference between a living organism and a nonliving thing, differences between plants and animals, food for humans and safe food preparation, and the needs of all living things for air, water, food and a "place to be."

Both teacher's guides, individual lessons, storybooks and math/reading supplemental materials are available for viewing online or downloading free-of-charge in PDF format from BioEd Online at www.bioedline.org/.

Meeting National Standards

Each My World and Me unit engages students and helps them acquire knowledge and skills aligned with state and national science education recommendations. The chart below details, by activity (1–11), how this unit meets science, mathematics and language arts skills. For your convenience, the information pertaining to each individual activity also appears under the Skills section for that activity.

	1	2	3	4	5	6	7	8	9	10	11
SCIENCE											
Observing		●	●	●	●	●	●	●		●	●
Sorting and classifying			●								
Predicting					●	●	●	●			
Comparing			●	●	●	●	●	●			
Contrasting			●	●	●			●			
Recording data	●		●	●							
Communicating	●		●	●	●		●		●	●	●
Interpreting data											
Generalizing		●				●	●				●
Applying knowledge			●	●					●	●	
Inferring										●	
Charting											
Identifying patterns			●				●		●	●	
Measuring											●
Sequencing											
Graphing								●			
MATHEMATICS											
Observing		●	●	●							
Sorting and classifying			●								
Predicting											
Comparing											
Contrasting											
Recording data	●										
Communicating	●										
Interpreting data											
Generalizing		●									
Applying knowledge											
Inferring											
Charting											
Identifying patterns											
Measuring											
Sequencing											
Graphing											
LANGUAGE ARTS											
Listening			●						●		
Communicating			●	●	●		●		●	●	●
Reading for information											
Identifying words									●		
Developing vocabulary	●	●	●	●	●	●	●	●	●	●	●
Understanding word meanings											
Developing comprehension skills											
Writing											
Using descriptive language	●	●							●		
Following directions									●		

Materials List

You will need the following materials and consumable supplies to teach this unit to 24 students working in six cooperative groups. See the Setup section within each activity for specific preparations needed prior to class and alternative materials.

SAFETY ISSUES

Always follow all district and school science laboratory safety procedures. It is good laboratory practice to have students wash hands before and after any laboratory activity. Clean work areas with disinfectant.

ACTIVITY 1 (p. 1)

- Crayons or markers
- Drawing paper

ACTIVITY 2 (p. 3)

- Plastic terrarium or aquarium
- 24 hand lenses
- 6 plastic containers
- 6 (or more) live walking stick insects
- 5 cm of topsoil (to cover base of terrarium)
- Branches (several small)
- Screen-type cover for terrarium
- Water in a spray bottle (mister)

Alternate materials

- Plastic or glass aquarium
- 24 hand lenses
- 6 (or more) live crawfish
- 6 plastic containers
- 5 cm water
- Air pump with an air stone
- Gallon jug of water
- River rocks or gravel (a few rocks above the water level)
- *Optional:* De-chlorination tablets

ACTIVITY 3 (p. 5)

- 24 hand lenses
- 6 containers or bags containing four sets of natural materials and their matching designed/changed material (see activity for details)
- Small, resealable plastic bags for loose materials.

ACTIVITY 4 (p. 8)

- 12 bags or trays
- 12 natural food items
- 12 processed food items that match the natural food items
- Crayons or markers
- Sheets of drawing paper

ACTIVITY 5 (p. 11)

- 49 disposable plates (8 inch)
- 25 craft sticks
- 25 resealable plastic bags, quart size
- 13 bananas
- 13 plastic knives
- 12 medium- to large-sized resealable plastic bags (for card sets)
- 4 bottles of Hershey's Shell® or other liquid chocolate
- Access to a freezer
- Crayons
- Glue or tape
- Insulated cooler, large

ACTIVITY 6 (p. 16)

- 20 ice cubes (approx.)
- 2 clear cups (or beakers)
- 2 cups of sand
- Clear plastic box (shoebox size or slightly larger)
- Cup, heat resistant
- Electric hot plate or microwave
- Ice, approx. one cup
- Lamp with incandescent bulb (if sunny window is not available)
- Large rubber band, 7 in. x 1/8 in. (to hold plastic wrap on the box)
- Plastic cup, 8-oz graduated
- Plastic wrap (to cover the box)
- Pot or pan, small
- Water, approx. one cup

Materials List

ACTIVITY 7 (p. 19)
- 24 small cups
- 9 clear plastic bags, small
- 5 clear plastic containers, shoe-box size
- 5 roles of tape (or share)
- 4 bottles of food coloring, different colors
- 4 small toy cars
- 2 large plastic tubs or containers
- 2 tbs cooking oil
- Bar of mild soap (small)
- 1/2 cup of soil
- Paper towels
- Pictures of water sources (several)
- Unseparated roll of blue or white plastic trash bags (approximately 6 meters of the roll)
- Water

ACTIVITY 8 (p. 23)
- 50 sheets of heavy, white or light colored paper, 9 in. x 12 in. (to make "picture frames")
- 24 coat hangers
- 24 hand lenses
- 24 pairs of scissors
- 24 plastic knives
- 24 sets of prepared "picture frames"
- 24 sheets of wax paper, 8-in. in length
- 6 medium-sized jars of petroleum jelly
- 6 sheets of butcher paper, 2 meters in length
- Construction paper in assorted colors, and drawing paper
- Cotton balls
- Crayons and/or markers
- Glue and tape
- Pair of scissors (or an X-acto knife, ruler and cutting board)
- Roll of wax paper

ACTIVITY 9 (p. 26)
- Copy or copies of *Tillena Lou's Big Adventure* (available in PDF format in the Library section at http://www.bioedonline.org/.)
- Crayons or markers
- Drawing paper

ACTIVITY 10 (p. 28)
- Copy of *The Three Little Pigs* storybook
- Craft sticks
- Crayons and markers
- Drawing paper
- Glue
- Lincoln Logs®, building blocks, sticks, leather or plastic, ice cubes, tent materials (fabric), or Lego® bricks
- Scraps of real building materials
- Tape

ACTIVITY 11 (p. 30)
- 12 resealable, small plastic bags
- 12 sheets of white cardstock

TILLENA LOU'S BIG ADVENTURE

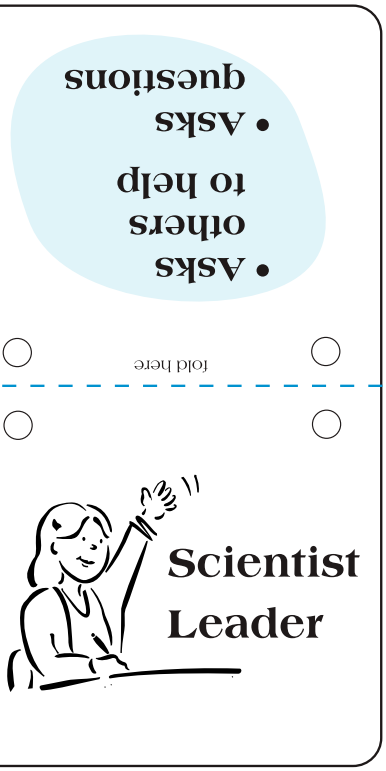
The unit's storybook, *Tillena Lou's Big Adventure,* is available in PDF format online at BioEd Online. It may be viewed on computers or mobile devices, or downloaded free from www.bioedonline.or/library/storybooks/.

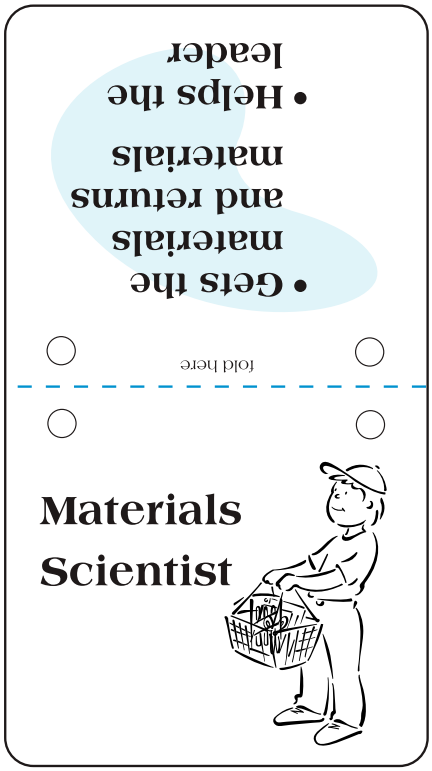
Using Cooperative Groups

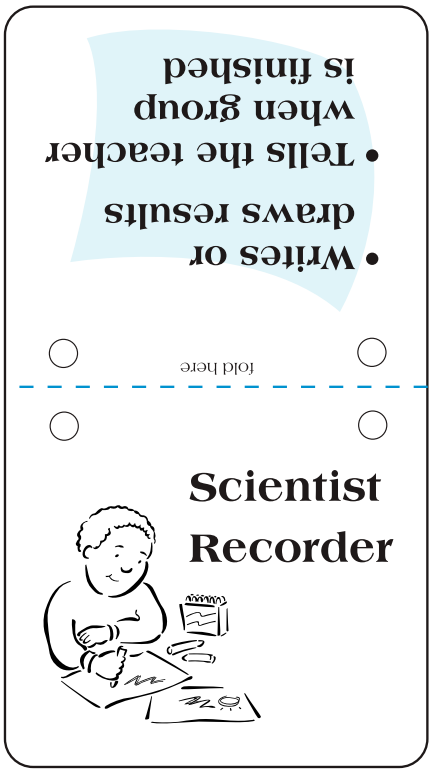
Cooperative learning is a systematic way for students to work together in groups of two to four. Quite often, early primary students need to have their own materials, but can work in groups to share ideas and to learn from one another. Through such interactions, students are more likely to take responsibility for their own learning. The use of cooperative groups provides necessary support for reluctant learners, models community settings where cooperation is necessary, and enables the teacher to conduct hands-on investigations in a more manageable environment.

Students wear job badges that describe their duties. Tasks are rotated within each group for different activities so that each student has an opportunity to experience all roles. Teachers even may want to make class charts to coordinate job assignments within groups.

Once a cooperative model for learning has been established in the classroom, students are able to conduct science activities in an organized and effective manner. All students are aware of their responsibilities and are able to contribute to successful group efforts.



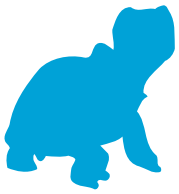




Word Bank

As you work through the unit, the following words or phrases may be used to reinforce or supplement the activities. Space has been provided for you to add your own words to the list.

air
animal
plant
consumer
producer
fruit
habitat
hunger
living
mammal
model
moist
need
necessary
nonliving
nutrient
observe
organism
evaporation
water vapor
resources
predict
radish
record
reproduce
root
seed
skin
soil
spider
sugar
sunlight
survive
vegetable
want
worm



My Science Journal

Name _____ Date _____

Project Name _____

DRAWING

KEY WORD TO USE

I OBSERVED . . .

_____

_____

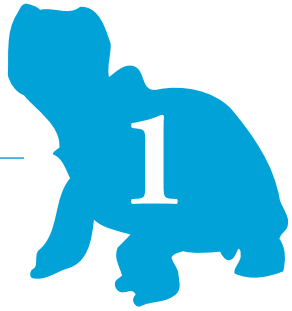
_____

_____

_____

_____

Assessments



Pre-assessment and post-assessment activity designed to evaluate students' knowledge of the origins of natural and processed resources before beginning the unit, and again, upon completion of the unit.

In the unit entitled, "Living Things and Their Needs," students learned the basic needs of plants and animals: air, water, food (source of nutrients and energy), and space or a place to be. This unit builds on those concepts by focusing on how basic needs are met for humans and other organisms.

All of an organism's surroundings make up its environment. Environments include both nonliving factors, such as temperature and atmosphere, and living factors, such as other plants, animals and micro-organisms.

Resources, which are anything obtained from the environment to meet the needs or wants of an organism, also can be classified as having living or nonliving origins.

SETUP

Have each student complete his or her own assessment. You may wish to seat students in groups to share materials.

PROCEDURE

1. Explain to students that they will be learning about resources—the things people and other living things need to survive, grow and reproduce—and to recognize the origins of resources and whether they are natural or designed.
2. Begin by asking students about the basic necessities of life: food, water, air and place to be. Ask, W*hat do plants need to grow? Do animals need the same things as plants? What do people need? How are these needs met?* (i.e., how do animals get these basic needs).
3. Provide each student with a student sheet. In each of the four boxes a natural or a designed basic need of people is featured. Students will draw a possible source of the example given. For example, the "Food" box contains an apple (natural). The student might draw an apple tree as the source for the apple. Ask leading questions like, *Where does an apple come from?*
4. Encourage students to share their work and display it in the classroom until the end of the unit. Upon completing the unit, have students revisit their drawings and ask them to create new drawings based on what they have learned.

CONCEPTS

- All living things need air, water, food and a place to be (space).
- Organisms can survive only in environments in which their needs are met.
- A resource is anything that an organism gets from the living or nonliving environment.
- Objects can be classified as natural or designed.

SKILLS

- Recording
- Communicating
- Describing

TIME

Class: 30–45 minutes

MATERIALS (see Setup)

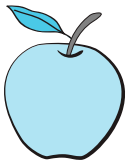
Materials per Student

- Crayons or markers
- Drawing paper (for the post-assessment)
- Student sheet

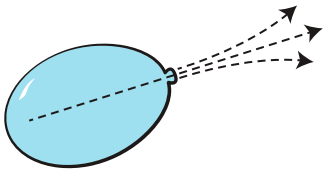
Where Did This Come From?

Name _____ Date _____

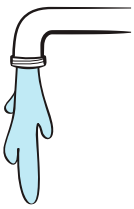
Food



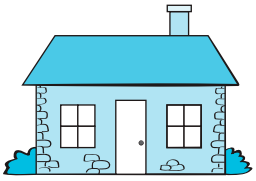
Air



Water



Place



Resources and Animals

Students observe, examine, discuss and draw a walking stick insect or a crawfish in its natural environment.

Resources are the things people and other organisms obtain from the living and nonliving environment. Resources provide for the needs and wants of a population (group of the same kind of organism). All plants and animals depend on the resources in their environments to live and reproduce.

Animals use resources without modification in most cases. Examples of resources that are used in their natural state include air for breathing; plants, animals and other organisms as food; and water for drinking. An animal's place to be may be one of many specific environments that will meet its needs. However, some animals create their shelter or places to raise their young using materials readily available. For instance, a beaver builds a lodge; a bird builds a nest.

SETUP

Order either live walking stick insects or live crawfish from a biological supply company. (Each student group will study one individual animal.) Prepare the type of habitat you need in advance.

To prepare a terrarium for the walking stick insects, cover the base with about 5 cm of topsoil. Place branches inside for the insects to crawl on. Add the insects and cover the terrarium with a screen. Spray or mist the terrarium daily with a small amount of water.

To prepare an aquarium for crawfish, place river rocks or gravel in the base. Fill the aquarium with at least 5 cm of water. Add a few rocks above the water level. If using tap water, let the water sit at least 24 hours before adding the crawfish, or use de-chlorination tablets. Keep a gallon jug of tap water (aged for 24 hours), or a gallon jug of de-chlorinated water, for use as needed. Install a small air pump with an air stone. Add the crawfish.

Keep the animal habitat out of sight until the end of the activity.

If you do not have plastic containers, prepare 6 two-liter soft drink bottles (one per group). Cut off the top one third of each bottle and discard it. Place masking tape around the sharp edges of bottles.

PROCEDURE

1. Explain that our environment supplies the materials we need to live and grow. Ask, *Are all environments the same?* You may want to mention different kinds of natural environments, such as a pond, forest or grassland.
2. Give a plastic container to each group. Explain that you will be putting an animal in each container for the group to observe. Let students share what they know about care of living things. Discuss

CONCEPTS

- Resources are things in the environment that people and other living things use to meet their needs and wants.
- Resources can be nonliving or living. Some resources come from objects or materials that once were living, such as wood.
- Most animals use resources, without modification, just as they occur in nature.

SKILLS

- Observing
- Generalizing
- Describing
- Drawing and labeling
- Drawing conclusions

TIME

Setup: 1 hour
Class: 30 minutes

MATERIALS (see Setup)

Teacher Materials

- Terrarium
- 6 (or more) live walking stick insects
- 5 cm of topsoil (to cover base of terrarium)
- Branches
- Water in a spray bottle (mister)
- Screen-type cover for terrarium

Alternate Materials (see Setup)

- Aquarium
- 6 (or more) live crawfish with 5 cm of water
- Air pump with an air stone
- Gallon jug of water
- River rocks or gravel (a few rocks above the water level)

Optional: De-chlorination tablets

Materials per Student Group

- Plastic container
- Walking stick insect or crawfish

Materials per Student

- Hand lens

MAINTAINING THE ORGANISMS

Walking Sticks

Use a misting bottle to provide water. Mist the interior of the habitat every day to keep the soil slightly moist. Walking sticks are herbivores. Feed them fresh leaves of Romaine lettuce, or collect raspberry, rose or apple leaves for them to eat.

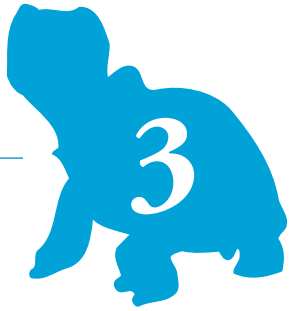
Crayfish

Turtle pellets are a suitable food for crayfish. Feed about three pellets per crayfish, 2–3 times per week. Crayfish usually will not eat when they are being observed.

the handling of animals. Emphasize that students need to respect the animal as a living organism. They may use the hand lens to observe the animals, but should not put their hands inside the container.

3. After giving each group a living organism, ask them to draw the animal and label any parts they are familiar with.
4. Then ask, *Do you think the animal can live in the environment inside the container? Why or why not? What do you think it needs to live? Are its needs being met? How can we provide it with its basic needs?* Discuss what the students know about how the animal gets air, water, food and shelter.
5. Ask the students to come to a central area and leave their animal in the container on the desk. Place the pre-prepared terrarium/aquarium in a central location with all the students around it. Ask them, *Do you think your animal could live in this environment? Why or why not? Does it have air? Water? Food? Space?* Discuss how the animal will get each need met. *Does the animal go to the grocery store, or grow its own food? Does it get water from the faucet or build houses?* Note that some animals do create shelter, or at least a place to raise their young, but not like people do.
6. One at a time let each group bring their animal (in its container) to the terrarium/aquarium and carefully place the animal into the terrarium/aquarium. You may have to help them carefully move it.
7. Encourage students to observe the animals daily and record the animals' behaviors in their journals, either in pictures or words. You may want to guide students by asking, *How does it move? How does it catch and eat food? Is it active at different times of the day? Does it appear to rest?*

Is It Natural or Transformed?



Students examine, compare, discuss and sort materials as natural or transformed (changed or processed by humans).

Resources are the materials people and other organisms obtain from the environment. Resources provide for the needs and wants of a population (group of the same kind of organism). All plants and animals depend on the resources in their environments to live, grow, and reproduce.

A variety of resources are used by people without much modification. Some resources that are used in their natural state include air for breathing (although it often is filtered in buildings), fresh fruits and vegetables for eating, and some spring water for drinking. People transform other resources to solve problems. Changed resources include cut timber and manufactured bricks for homes, cooked or prepared foods derived from raw goods, and water made drinkable by processing surface water. "Processed" means that something has been prepared or converted by a special treatment.

SETUP

Prepare 6 large bags, each containing four different pairs of materials for students to observe and sort. Make sure that each of the four pairs contains one natural item and its designed/processed companion.

EXAMPLES OF PAIRS OF OBJECTS

Natural	Transformed
sand (in container)	glass marble
tree twig	craft stick, pencil, clothespin
cotton boll	cotton fabric or cotton ball
seashell	shell button
wheat shaft	breakfast cereal, wheat flour
clay	clay pot or clay brick
limestone	chalk

PROCEDURE

1. Have students sit in a circle. Explain that the class will conduct a sorting activity and, that to demonstrate sorting, you will sort the students according to one attribute (e.g., shirt color, shoe type, etc.). Do not identify the attribute you plan to use. Have two or three of the students matching that attribute stand and move to one side of the circle. After a few minutes, ask the rest of the students having the same attribute to stand with the first group. Next, have the remaining students stand up and form a separate group. Ask the class to figure out how they have been sorted. Repeat the procedure using several different attributes.

CONCEPTS

- Anything that an organism obtains from its environment is a "resource."
- Resources can be nonliving or living. Some nonliving resources, come from objects or materials that once were living, such as trees and wood.
- People and other animals use some resources just as they occur in nature. Other resources are transformed into something else before they are used.
- Objects can be classified as natural or designed/processed.

SKILLS

- Observing
- Sorting and classifying
- Comparing
- Generalizing

TIME

Setup: 30 minutes
Class: 30 minutes

MATERIALS (see Setup)

Materials per Student Group

- Large bag containing four different pairs of materials. Each of the four pairs should contain one natural item and its matching designed/changed companion. Place loose materials, such as sand, in smaller, sealed plastic bags.

Materials per Student

- Hand lens
- Student sheet

EXTENSION

Encourage students to bring items from home to add to the materials. Use these materials in a sorting center in the classroom.

2. Arrange the students in groups of four. Pass out the bags of materials for sorting.
3. First, encourage each group to sort the materials in any way they like. Have them use hand lenses to observe the materials as they sort.
4. Next, tell students they will sort the materials into two groups: Materials that are natural (how they are found in nature) and materials that have been processed (products not occurring naturally, but transformed or combined with something else). Ask students about their groupings, making sure that they understand the difference.
5. Let each student share one item and explain why she/he thinks it is natural or processed. Have the student describe where the item might be found, and if it has been changed from its original state.
6. Have students match the two items belonging to each of the four pairs received by their group. Distribute the student sheets, and have each student draw and describe the pair of items.
7. Have students match the two items belonging to each of the four pairs received by their group. Distribute the student sheets, and have each student draw and describe one pair of items.
8. Distribute the worksheets. Have students draw a picture and write about the item.

Is It Natural or Processed?

Name _____ Date _____

Natural	Processed

4 Raw vs. Processed Food

Students gain an understanding of what "processed" means. They also distinguish between natural and processed foods, and learn about sources of some foods.

CONCEPTS

- Living things have basic needs.
- All foods that humans eat begin in a natural state.
- People eat some foods in their natural state (unprocessed) and some in a processed state. Not all foods are edible by people without processing.
- Human beings are among the few animals that process their food (others include leaf cutter ants, bees, and wasps).

SKILLS

- Observing
- Sorting and classifying
- Comparing and contrasting
- Matching
- Applying knowledge
- Communicating
- Charting

TIME

Setup: 10 minutes
Class: 45 minutes in one session

MATERIALS (see Safety Issues and Setup)

Teacher Materials

- 12 bags or trays
- 12 natural food items
- 12 processed food items that match the natural food items

Materials per Student Team

- Prepared bag or tray with one mixed set of food items, one natural and one processed (see Setup)

Materials per Student

- Crayons or markers
- Sheets of drawing paper

Food is one of the four basic needs of organisms that cannot make their own food through photosynthesis. Organisms that trap light energy through photosynthesis and use it to manufacture their own food are known as producers. Some animals eat parts of plants as food. Different kinds of animals rely on other animals or their waste for food. All living things that rely on producers for food are known as consumers. Food sources are critical resources in all environments.

People use a variety of food resources to meet their energy and nutritional needs. People eat both natural and processed foods. With a few exceptions (for example, bees and wasps), people are the only animals that process their foods. Processed foods are foods that are no longer in their natural state, because they either have been cooked or combined with other food ingredients. For example, a raw, whole apple is a food in its natural state. However, applesauce, which is made by cooking the apple, is a processed food. Roasted peanuts are no longer in their natural state because they have been cooked. Raw foods, such as carrots, celery and lettuce, are considered natural for the purposes of this unit.

SAFETY ISSUES

Many children have food allergies. You may wish to check with the school nurse or send a letter home to parents asking for this kind of information prior to conducting the activity.

Follow all district and school science laboratory safety procedures. Before and after the activity, have students wash their hands and clean work areas with disinfectant.

SETUP

You will need to obtain 12 natural food items and their matching processed food companions (e.g., an orange and a carton of orange juice, see "Companion Foods," p. 9). Prepare 12 mixed sets of food items, one set for each team of two students. Each set must contain one natural food and one processed food (for example, an orange and a tortilla).

Prepare one set of foods for demonstration during a class discussion of natural and processed foods.

Have students work in teams of two.

PROCEDURE

1. Before students begin handling food, make a point of demonstrating how to wash hands with soap and water. Have students wash their hands before proceeding with the activity.

COMPANION FOODS	
Natural	**Processed**
whole potato	potato chips
whole grape	raisin, grape juice
section of sugar cane	granulated sugar
ear of corn	tortilla, canned cooked corn kernels
whole strawberry	strawberry jam
brown rice	rice cereal
dried beans	canned beans
whole orange	orange juice
wheat berries	crackers, macaroni
tomato	salsa, catsup
carrot	cooked carrot
cucumber	pickle
milk*	cheese*
avocado	guacamole
whole raw egg	cooked egg
lemon	lemon juice, lemon candy
cinnamon stick	ground cinnamon
apple	apple sauce

* You also may want to mention that most milk sold in stores is pasteurized (heated) to kill germs.

Tip: Tell students to sing the "Happy Birthday" song completely to gauge how long to wash their hands—about 10 seconds.)

2. Gather students together in a semicircle in front of you and show t hem several unprocessed foods. For example, you could present an appleand a cucumber. Ask, *From where did these foods come? Can you eat them just the way they are? Can some other animal eat them?* As students answer, make sure they understand that the foods which are natural resources may be eaten just as they are. Now, show processed versions of the above foods (e.g., a jar of applesauce or a pickle). Ask, *Where did this applesauce come from originally?* (Is there an applesauce tree?) Make sure the students understand that applesauce is a processed food. Ask, *Can you eat the applesauce just the way it is? How has it changed from the apple?* Point out that since the apples are cooked and mashed, applesauce is a processed food. Ask, *Do animals eat applesauce?* Point out that unlike people, animals generally do not process their food. However, many animals, such as dogs or cats, will eat processed or combined foods.

WHAT IS "NATURAL"?

The word "natural" can have a variety of meanings on food labels and in reference to organic foods. Use of the term "organic" is regulated and refers to foods that have been produced without pesticides, chemical fertilizers, hormones or antibiotics.

EXTENSIONS

- Have students draw or write steps they think are taken to make a natural food into a processed food. You may have to assign the foods (e.g., a can of tuna fish, a box of cereal, a can of grape juice), for them to investigate.
- Make lunchtime observations. Ask, *What's in your lunch today?* Have students decide whether lunch food items are processed or natural.
- Draw pictures of natural foods, then draw processed foods made from the natural ones. Cut out drawings, laminate them and put them with baskets labeled "natural" and "processed" for a sorting center.
- At the conclusion of the activity, have a tasting party. For example, you could have a taco party with the tomatoes, tortillas, guacamole, etc.
- Read books, such as *The Magic Tortilla, Tortilla Factory,* and *The Little Red Hen.*
- Have students make a list of different natural and processed foods at a grocery store.
- Encourage students to find natural and processed foods at home, draw and name them, and bring their drawings to class.
- Make a classroom list, "All the Foods You Can Prepare With..." (e.g., tomato: pizza, spaghetti, soup, catsup; or apple: pie, sauce, cookie, cake, butter, jelly).
- Show videos or sets of pictures showing the change a natural food undergoes to become processed (National Geographic, *Window on Literacy,* etc.).

3. Repeat the steps above, comparing a cucumber and a pickle. Explain to the students that each one now will be given a food that they will identify as "natural" or "processed." Also explain that someone in the room has a match for their food that is the opposite category and they are to find that food.
4. Distribute one food set to each of the student pairs.
5. Allow time for student pairs to examine, discuss and identify their foods. Then line students up with their foods. One at a time ask them to step forward, show their food and decide if it is natural or processed and why they think this is. Ask questions to lead them to the correct classification like, *Do you think this could be growing on a tree just like it looks?* Ultimately, students should form two lines, one for natural and another for processed. Next, encourage the students in the natural line to find their match or matches in the processed line. Encourage them to discuss what they know about the food and any other possible foods that could be created from the natural food.
6. There may be more than one processed food for some of the natural items.
7. Distribute drawing paper and crayons or markers to each student. Have each student draw a picture of his or her food, color and cut it out.
8. Create a chart on the board, with one column labeled "Natural" and the other "Processed." Gather all students into a class group again. Explain that each will bring his/her food picture to the front of the class, name it and identify it as natural or processed. Then each student will attach the food picture to the chart under the appropriate column, natural or processed. The student(s) with the matching counterpart follows that student, attaching his/her food to the opposite column on the chart.
9. Ask students to share what they know about their foods: where the food comes from, and what they think was done to make the processed food.

Make a Processed Food

Each student prepares a processed food (frozen banana pop) and eats the product.

The United States Department of Agriculture (USDA) recommends eating 4–5 servings of fruits and vegetables per day as part of a balanced diet. People eat fruit and vegetables in both natural (unprocessed) and processed states. Depending on the desired outcome, getting a fruit to a processed form may take a sequence of steps. These steps may include steaming, freezing, boiling, baking or drying. Also, additional ingredients can be added to the fruit to create a processed food.

Many nutritious foods have been processed to make them safer or more convenient. In fact, people have processed fresh foods for thousands of years. Some methods of processing, such as cooking, may make food tastier, easier to eat or more digestible. Other forms of processing, such as salting, canning, smoking, freezing and drying, help to prevent food from spoiling for long periods of time. Many modern processed foods have been created to save time and facilitate meal preparation.

Many foods in the market are designated as "organic." In general, organic foods are produced without the aid of chemical fertilizers and pesticides. Organic meats and poultry are raised without antibiotics and other chemical additives, and receive food grown without chemical fertilizers, pesticides or genetically modified seeds. As with other foods, many organic foods are cooked or processed in other ways. The USDA has produced standards for organic production.

SAFETY ISSUES

Some children may have special food allergies. You may wish to check with the school nurse or send a letter home to parents asking for this kind of information prior to conducting the activity.

Follow all district and school science laboratory safety procedures. Disinfect work areas prior to and after this activity. Have students wash their hands with soap and water before and after handling food items. For sanitary reasons, make sure students keep their peeled bananas on the disposable plates.

SETUP

Chocolate shell desert coating is a liquid chocolate that quickly hardens when applied to a cold surface, such as when drizzled on a scoop of ice cream. For the activity, the bottles of chocolate shell need to be at room temperature.

You will need access to a freezer in which to place the student-prepared bananas. The bananas will need to freeze for at least 12 hours. Use an insulated cooler to move the frozen bananas from the freezer to the classroom.

CONCEPTS

- Food is one of the four basic needs of consumers, such as animals.
- Humans eat a variety of foods, some natural and some processed.
- Only humans cook and process foods (with a few exceptions).
- A processed food is altered in some way from its state when picked, harvested or prepared for market.
- Materials can exist in different states (solid, liquid, gas, plasma).

SKILLS

- Observing
- Generalizing
- Comparing and contrasting
- Following directions
- Sequencing

TIME

Setup: 10 minutes each day
Class: 20 minutes on Day 1, 30 minutes on Day 2

MATERIALS (see Setup)

See page 12 for complete list.

MATERIALS

Teacher Materials

- 12 medium- to large-sized resealable plastic bags (for card sets)
- 4 bottles of Chocolate Shell® or Hershey's Shell® liquid chocolate
- Access to a freezer
- Banana
- Craft stick
- Disposable plate, 8 in.
- Insulated cooler, large
- Resealable plastic bag, quart size
- Plastic knife

Materials per Student Team

- 4 disposable plates, 8 in.
- 2 craft sticks
- 2 resealable plastic bags, quart size
- Banana (unpeeled)
- Crayons
- Glue or tape
- Plastic knife
- Prepared set of "Make a Banana Pop" cards in a plastic bag

Optional: Copies of "My Science Journal" sheet

Make 12 photocopies of both student sheets. Before cutting out the cards on the pages, separate the pages into 12 sets. Cut out the cards in each set. Place each set of cards in a medium- to large-sized resealable plastic bag, then mix up the cards inside each bag.

Depending on the age of the students, you may wish to write each student's name on his or her craft stick.

Day 1: Prepare a demonstration set using a whole banana, and material sets for each student team. Student pairs should work together to prepare the bananas.

Day 2: Prepare materials for each student team. Have students work individually to finish preparing his or her banana pop.

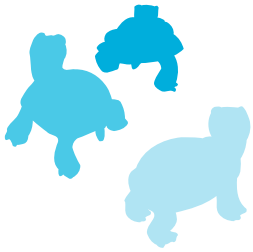
Optional: Large strawberries may be substituted for the bananas. See "Safety Issues."

PROCEDURE

Day 1

1. Before students begin handling food, make a point of demonstrating how to wash hands with soap and water. Have students wash their hands before proceeding with the activity.

   Tip: Tell students to sing the "Happy Birthday" song completely to gauge how long to wash their hands—about 10 seconds.
2. Gather students in a semicircle and review the differences between natural and processed foods. Explain that today, each student will be given a natural food and will follow steps to process it. Show a whole banana to the group and ask, *What is this?* [banana] *To which food group does it belong?* [fruits] *Do we eat it like this?* [We have to peel it.] *Why? Why does it have a peel?* (The peel is inedible, but it protects the delicate edible part inside.) Demonstrate how to cut a banana in half with a plastic knife and note that each student team will receive a banana, which they will cut in half.
3. Peel a banana, cautioning students to keep their peeled bananas on their disposable plates for sanitary reasons.
4. Show students the craft stick and instruct them to use their crayon to write their names on one end of their sticks (or have names already on sticks). Follow by showing students how to push the unlabeled end of the stick into the center of the cut end of the banana. Instruct them to push the stick as far as possible, but to leave the name end visible.
5. Demonstrate how to place the banana in the plastic bag, leaving the name end of the stick visible. Explain that you will put the prepared bananas in the freezer overnight, and that in tomorrow's class, students will continue the steps for processing their bananas into chocolate banana pops.
6. Divide students into teams of two. Give a set of "Make a Banana Pop"



sequence cards to each team and ask the students to arrange the cards in the correct sequence. Then discuss the proper sequence and encourage students to correct any mistakes they made. Have students glue the cards on a sequence strip, which will serve as a reference when they make their banana pops.

7. Have one student from each pair collect his/her team's supplies from the supply table.
8. After students have prepared their bananas, ask them to place their bananas in the cooler. Transport the frozen bananas to and from the classroom in an insulated cooler.
9. Put the bananas in a freezer until the next class period (at least overnight).
10. Instruct everyone to clean up his/her work area.

Day 2

1. Before students begin handling food, have them wash their hands with soap and water for at least 10 seconds.
2. Distribute each team's "Make a Banana Pop" sequence strip that students made in the previous class session. Have students review before they complete the steps in making their banana pops.
3. Give each student the banana pop he or she prepared the day before. Explain that each student should carefully remove his or her banana from its plastic baggie and place it on a paper plate.
4. Distribute the bananas, reading students' names from the sticks. After students have unwrapped their bananas, ask, *Has your banana changed?* Discuss. Then, pour a small pool of chocolate shell onto each student's plate. Have students to roll their frozen bananas in the chocolate to coat bananas fully. Have students wait a few minutes and watch the change in the chocolate coating as it solidifies on the bananas. Then, it's time to eat! Be aware of any food allergies children may have before inviting students to eat their bananas.
5. Have students join you in a circle. Ask, *What differences do you notice in your banana today? Did freezing the banana change it?* After the students respond, point out that freezing is a step in food processing. Ask, *What happened to the chocolate when you coated it on the frozen banana?* [It hardened.] Help students understand that the chocolate was liquid and, when it froze, it became solid. Mention all things are either a solid, liquid or gas, and that the change in the chocolate is a good example of change in states of matter. Ask, *Do you think coating the banana with chocolate is a step in processing it?* Make sure the students understand that they have made a processed food, banana pop, from a food in its natural state.

FOOD HAZARDS

Fresh meats, poultry and other grocery items may contain disease-causing bacteria on their surface. Always wash hands after handling raw foods, and store these items away from other food items in the refrigerator.

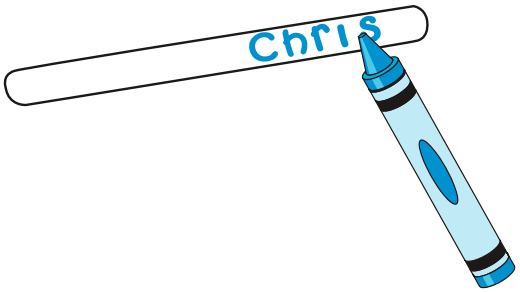
EXTENSIONS

- Use "Make a Banana Pop" sequence cards to make a recipe book.
- Use other fruits, such as strawberries, to make fruit pops.
- Experiment with other forms of food processing using ice cream or pudding.
- Have each child draw the shape of a banana on yellow construction paper and cut it out. Then have students write adjectives to describe their banana pop on the paper banana.
- Discuss other foods that have natural packaging (banana peel).

Make a Banana Pop

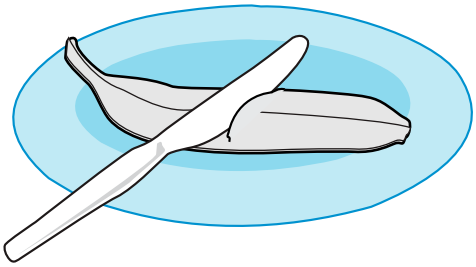
STEP

Write your name on one end of the craft stick.



STEP

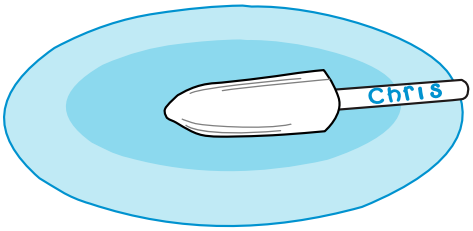
Cut one banana in half.



Peel your half of the banana. Put the peeled banana on the plate.

STEP

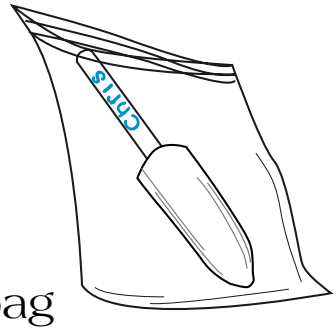
Gently push the "clean" end of your craft stick into the banana



Your name will show on the craft stick.

STEP

Place the banana in the plastic bag. Close the bag and seal it.

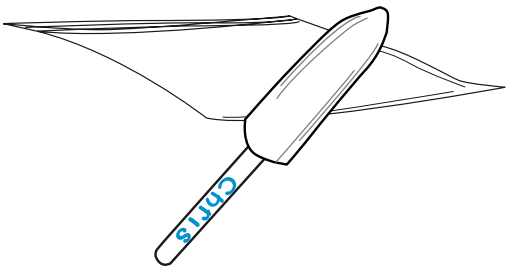


Put the bag in the freezer. Leave it there overnight.

Make a Banana Pop

STEP

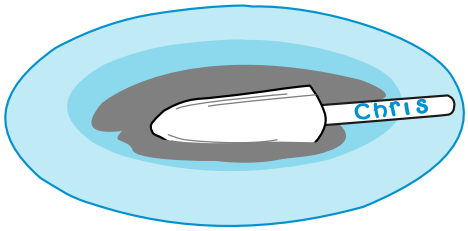
Get your bag with the frozen banana in it.



Remove the banana from the bag.

STEP

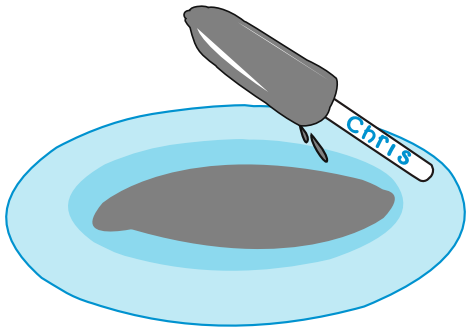
Place the banana in the chocolate sauce on the plate



Keep the craft stick out of the sauce.

STEP

Roll the banana in the chocolate sauce.



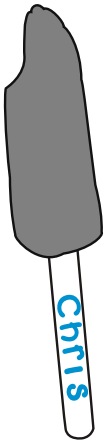
Lift the banana out of the sauce.

STEP

Observe what happens to the chocolate sauce on the banana.

Eat your treat!

Clean up.



6

Making a Water Cycle

Students observe a simple model of the water cycle constructed of sand and ice in a plastic shoe box.

CONCEPTS

- Water can be found naturally as a solid, a liquid and a gas.
- Water circulates among these three states in the water cycle.

SKILLS

- Predicting
- Making and recording observations
- Drawing conclusions

TIME

Preparation: 10 minutes
Class: 15 minutes to set up; 30 minutes to observe and draw conclusions.

MATERIALS (see Setup)

Teacher Materials

- 20 ice cubes (approx.)
- 2 clear cups or beakers
- 2 cups of sand
- Clear plastic box (shoebox size or slightly larger)
- Cup, heat resistant
- Electric hot plate or microwave
- Ice cubes, approx. one cup
- Lamp with incandescent bulb (if sunny window is not available)
- Large rubber band, 7 in. x 1/8 in. (to hold plastic wrap on the box)
- Plastic cup, 8-oz graduated
- Plastic wrap (to cover the box)
- Pot or pan, small
- Water, approx. one cup

Materials per Student

- Copy of the student sheet

Water is constantly moving in a cycle. Water is one of the few substances that can be found in all three states—solid, liquid and gas—at any given time somewhere on Earth. For example, snow and ice are present at the poles, as well as on the tops of high mountains. Liquid water is abundant in many places, including lakes, rivers, oceans, and underground. Water vapor, the gas phase of water, usually is present in the air around us (up to 5%), and can be observed as steam when liquid water is heated.

If water were not continuously cycling among its three states, the world's stores of freshwater quickly would become depleted or polluted. Fortunately, our supply of freshwater continually is collected, purified and redistributed as part of the water cycle. This continuous process replenishes our water sources through precipitation (rain, mist, snow and sleet, for example). Some of the water from precipitation soaks into the ground. The rest runs off into streams, lakes and the oceans. Heat from the sun makes water vapor from the oceans, lakes, rivers, trees, plants, and land in a process called evaporation. As it cools, the water vapor forms clouds. This is called condensation. Water vapor collects in the atmosphere until there is too much for the air to hold in clouds, leading to rain or snow.

This activity allows students to observe the water cycle.

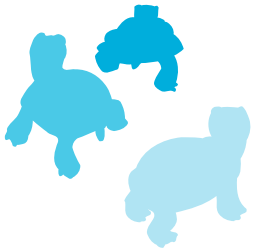
SETUP

Collect materials needed and conduct this activity with students observing.

Heat a cup of water until it is very hot or boiling to use for a demonstration.

PROCEDURE

1. In front of class, compare a glass of water to a glass of ice. Ask, *How are the water and ice alike and how are they different?* Point out that the water and ice are two different states of matter, much like the liquid and solid chocolate on the banana pop.
2. Explain that water can exist not only as a liquid and a solid, but also as a gas. Show students the steam rising from the surface of the hot water. Explain that the water is changing from a liquid to a gas. Make sure that students understand the difference between the gas (gasoline) used in a car and a gas such as air.
3. In front of the students, measure out two cups of sand and place it in a pile at one end of the clear, plastic box.
4. Smooth the sand to create a hill at one end of the box, gradually sloping it to cover about 2/3 of the bottom of the box. This will form the land in the model.
5. Place 20 ice cubes on top of the "hill" in the box. The ice cubes will be



"snow" and "ice" in the model.

6. Cover the box with a sheet of clear plastic wrap and secure it with a large rubber band and/or tape. (If using plastic storage boxes, cover securely.)
7. Discuss the model with the class. Ask, W*hich part of the model could represent land? Which part could represent snow on the tops of mountains? Do you think a lake could form? Where might it be?* Ask students, *What do you think will happen if we put the box in the sun?*
8. Place the box in a sunny window, outside or a under a lamp with an incandescent (not fluorescent) light bulb. If possible, have the students observe the box at intervals throughout the day. Otherwise, have them observe the box within the next day or so.
9. Instruct students to draw the water cycle box in their journals and to predict what might happen over time.

Session 2: Looking at results

1. Have the students observe the box without removing the cover. Ask them to note the changes that have occurred inside the box. Ask, *What happened to the ice cubes?* [they melted] *What else is different about the inside of the box*? [water has collected on bottom] In most cases, at least a few drops of water will have condensed on the inside of the covering. Ask, *Where did the drops of water came from?*
2. Help students understand that all three states of water have been present in the box. Review the different states in which water can be found—ice or snow (solid), liquid water and water vapor. Breathe on a mirror or piece of glass to show students how water vapor condenses on a surface. OR boil a small container of water, so that students may observe the cloud of steam. Hold a glass or mirror above the steam.
3. Remove the cover from the box. Have students observe the surface of the sand. Ask, *Has the surface of the sand changed? In what ways has it changed?*
4. Talk about where the water in the box has gone. Ask, *Where was all of the water in the box when we started? Where is the water now?* If students have not noticed that the surface of the sand is wet, point out that some of the water has run into the bottom of the box to make a "lake" and some has soaked into the sand. Help students understand that the same processes take place outside when it rains and snows.
5. Give each student a copy of "The Water Cycle" page, or place it on a document camera. Have students identify the forms in which water is present in the diagram (for example, snow on mountain tops is a "solid" form of water, and water evaporating from the ocean represents water in a "gas" phase). If using individual copies with very young students, direct each child to place a sticker everywhere on the page where he or she can find some form of water.

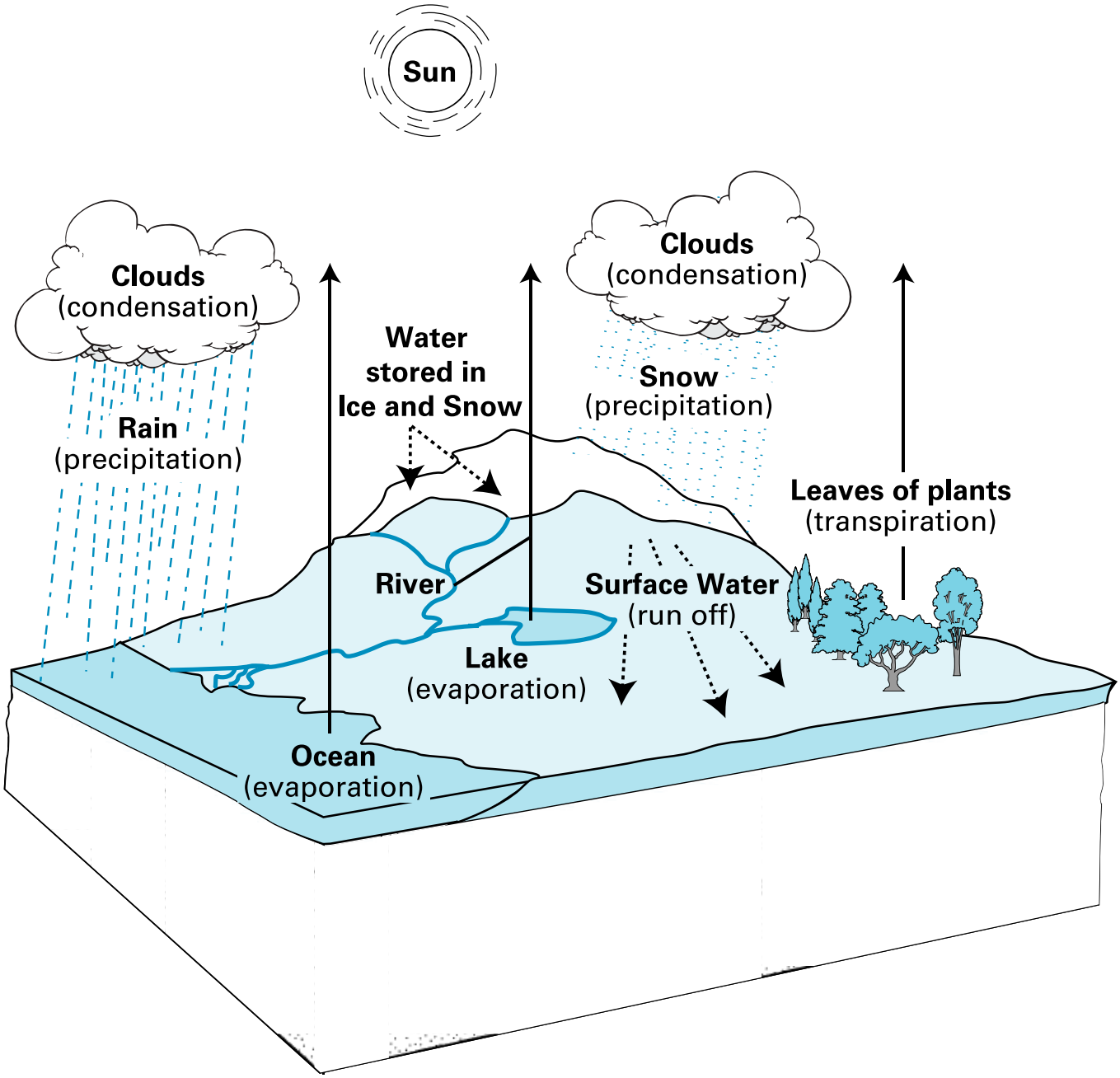
EXTENSIONS

- Have students design experiments to test what happens to chemicals in soil by placing drops of food coloring on the sand in the shoeboxes before adding the ice cubes. Ask them to note where the colors end up in the system.
- Instead of using a box, add small amounts of sand and ice to plastic resealable bags. Tape the bags to a window.
- To help students understand evaporation, fill a pie pan with water that is colored with blue food coloring. Set it out in the classroom where students can observe it. The initial water level will leave a blue stain. Encourage students to note each day the water level so that they can witness its evaporation. Mark the water level each day and chart it until the water is gone.
- Teach the students a song they can sing to the tune of "Oh, My Darling Clementine." The alternate lyrcs are:

  Evaporation,
  condensation,
  precipitation
  on my mind.
  It is called the
  water cycle,
  and it happens
  all the time."

  Add hand movements or point to a chart of the water cycle as you sing.
- Challenge students to think about what would happen if other substances (for example, chemicals, oils, etc.) also were present either on the surface or mixed in the sand.

The Water Cycle



River Ecology

Students simulate activities that can affect a water source, like a river as it flows from one place to another within a community.

We usually think of water as a liquid. However, if this important resource were not continually cycling among its three states, the world's stores of freshwater quickly would become depleted or too polluted to use. Fortunately, our supply of fresh water continually is collected, purified, and redistributed as part of the water cycle.

Each of us uses water in many ways each day. Some of these uses are essential for life. For example, it is recommended that we drink 8 to 10 glasses of water each day to stay healthy. About half the drinking water used in the US comes from lakes and rivers. The other half comes from springs and wells that reach water located deep underground. Because water sources are connected, pollutants travel from one part of the system to another. Much of our water has to be treated to make it safe to drink. Chlorine, for example, is added to water in most places to kill germs that make us sick. Sometimes, without knowing it, we do things that harm our water supplies. When we use too much fertilizer or pesticide on our lawns, gardens or fields, some of it can end up being washed into rivers and lakes. Once there, it can harm fish and other animals. It also can make water unsafe for drinking. Harmful chemicals can seep deep into the ground and pollute water sources there. Farmers use water to produce crops and raise livestock. Factories need water to make many products. Water is used in power plants that make electricity. Since we use water in many ways, we need to take care of our water sources.

Because water is essential for our bodies and also many of our daily activities, it's important that the water we use is not contaminated with materials that might harm our health. The Safe Drinking Water Act of 1974 required the Environmental Protection Agency (EPA) to establish national standards for drinking water quality. The EPA sets maximum allowable concentration levels for pollutants that can harm humans.

Wastewater treatments can involve up to three levels of purification. First, water is filtered mechanically to remove debris and large particles. Next, biological wastes are removed by mixing the waste with bacteria and other microbes, which use the waste as food. Solids that settle out during this process are removed as sludge. Additional advanced water treatments lower the quantities of specific pollutants still left in water through a variety of means. Finally, wastewater is disinfected, usually with chlorine, to remove water coloration and to kill any remaining disease-carrying bacteria and some viruses.

SETUP

One or two days before conducting this activity, ask students to find

CONCEPTS

- Water circulates continually through the water cycle
- Water is used in many ways each day.
- Because of the water cycle, polluted water can move from one water source to another.
- It often is possible to prevent pollution of water sources.
- Organisms cause change in the environment.
- All organisms depend on their environment.

SKILLS

- Observing
- Predicting
- Generalizing
- Following directions
- Sequencing
- Communicating

TIME

Setup: 15 minutes each day
Class: 30 minutes first day, 30 minutes second day

MATERIALS (see Setup)

Teacher Materials

- 24 portion-sized cups
- 6 clear plastic bags, qt-size
- 5 medium-sized tubs or plastic containers
- 5 rolls of clear tape (or share)
- 4 bottles of food coloring, different colors
- 4 small toy cars
- 2 large, clear tubs or containers
- 2 tbs cooking oil
- 1/2 cup of soil
- Bar of mild soap (small)
- Blue or white plastic trash bags, about 6 meters, unseparated
- Paper towels
- Pictures of water sources,and animals that live in or near a river
- Water

Materials per Student

- Copy of "My Science Journal," page

OPTIONAL DEMONSTRATION

Demonstrate for the whole class (or allow students to work in groups) an activity that attempts to clean the pollutants out of the water from the polluted river.

1. Hold up a clear plastic cup of the water from the river container. Ask, *Would you want to drink this water? Why or why not? What did we put in the water in our previous activity?* Make sure the students name all of the contaminants in the water. Ask, *How do you think we could clean this water? Record their ideas on the board.*
2. Explain that our drinking water usually goes through a filtering process so that it is safe for us to use.
3. To create a water filter, cut a 20-oz plastic soft drink bottle into two parts, 1/3 of the way from the top of the bottle. Insert the top part, with its opening down in the bottom part (no cap)
4. Place 1 coffee filter, 1 square of cheesecloth, and 1/4 cup aquarium charcoal into the funnel-like section.
5. Carefully and slowly pour a dirty water sample through the filter. Ask, *What do you notice about the water going into the filter? What does the filter look like now that the dirty water has gone through it? Would you like to drink this water now? Why or why not? Is it safe?* Point out that processed wastewater must pass EPA standards before it is safe to drink.
6. Use a home filtering system (e.g., "Brita®") to filter the dirty water and compare it to the filtered water of the class experiment.

(or draw and color) pictures of water sources and animals living in or near a river.

On the day you conduct this activity, unroll, but do not separate, about 6 meters of blue or white plastic trash bags. The connected trash bags will model a river.

One large tub will be used to collect water from students. The other large tub will model the river's end (a lake).

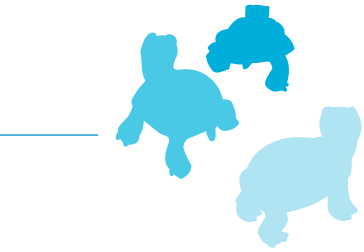
The class will be divided into five groups. Make a large name card for each group (see list below) and prepare props as follows.

Fill each of the 5 medium-sized tubs with about 6 cm of water. Fill 20 portion-sized cups half full of water. Provide Groups 1–4 with four cups of plain water.

1. **Children at Home** – Place the bar of soap in a plastic bag (students will share) and provide paper towels to dry their hands.
2. **Car Wash** – Rinse four toy cars in water, then roll them in dirt. Shake off the dirt. Place the cars in a plastic bag.
3. **Auto Shop** – Measure 1/2 tsp of cooking oil into four portion-sized cups.
4. **Farm** – Place 1/8 cup of the soil into each of the 4 plastic bags.
5. **Chemical Plant** – Take 4 of the portion-sized cups of water and add food coloring in order to make one cup of red water, one cup of blue, one cup of yellow, and one cup of green.

PROCEDURE

1. Gather the students in front of you in a semi-circle. Ask them to share the pictures of water sources they brought to class. Connect their answers to the story, Tillena Lou's Big Adventure (see sidebar, right). Ask, Does Tillena Lou have a source of water nearby? Place the pictures on a bulletin board.
2. Review the water cycle with the students using the illustration from the activity, "Making a Water Cycle," (see page 16).
3. Tell students they will investigate how different activities in a community might affect a river and a lake. Explain that each group will be located at one of five different places along a "river," and that you will collect their "used" water in a bucket, as if they were pouring it into the river.
4. Divide the students into five groups and seat each group throughout the room where the river will flow, in the order as listed above. Place the "Children at Home" near the source of the river. Begin to weave the "river" through the classroom, past each group, until it ends at the large plastic container that represents a lake.
5. Give the five groups their props, as described in Setup.
6. Visit the "Children at Home." Explain that they wash their hands



before eating, brush their teeth, take baths, wash clothes, etc. Have each student use the soap and small cups of water to wash his/her hands in the group's container of water. Tell students your tub represents the river. Have students pour their container of water into the tub. Ask, *What has just happened to the water used by these people?* Explain that usually our "dirty" household-use water is sent through a sewer system and purified, but if it were not, it could end up in the water source, i.e., the river.

7. Proceed to the "Car Wash." Have students use their cups of water to help clean the dirty cars in their container of water, then pour the dirty water into your tub. Ask, *What just happened to the water used by these people? Will it go somewhere else on the river?* Explain that most car wash facilities filter their wastewater and route it to water treatment plants.
8. Go to the "Auto Shop." Explain that the auto shop changed the oil in several vehicles and let oil spill on the floor. Then they washed the floor, letting the oily water flow into the street gutter. Have students pour the oil in their large containers of water, then pour it into your tub. Ask, *What happened to the oil? Will it move with the river?*
9. Visit the "Farm." Explain that the farmers often spread fertilizer on the soil to grow more crops. When they water their fields, some of the fertilizer and soil erodes or is washed into the river. Have students add their soil and cups of water to their containers of water, then pour the dirty water into your tub. Ask, *Where did some of the fertilizer and soil go? Will it stay in the river? Is it good for the river?*
10. Finally, go to the "Chemical Plant." Explain that the plant where they work had an accidental chemical spill. Have students add their colored water to their container of water, then empty it into your tub. Ask, *What will happen to the chemical waste now? Is it good for the river water?* Clarify for students that modern chemical plants have safeguards in place to prevent contamination in the event of a chemical spill. If the safeguards were not in place, the chemicals could end up in the water supply.
11. Follow the river to the end—to the large plastic tub. Explain that the river has ended in this lake. Pour the contents of your bucket into the lake. Have students come up to the "lake" to look at its water. Ask, *What do you see? Can you see evidence of what you added to the river from your community?* Give students an opportunity to respond before explaining that pollution comes from many sources and that everyone can help to prevent it. Ask, *Would you like to drink this water? What would happen to the animals living in the river if the water was polluted?*
12. Ask the class, *How do we use water every day?* Make sure students understand that water is needed for numerous reasons (for personal use

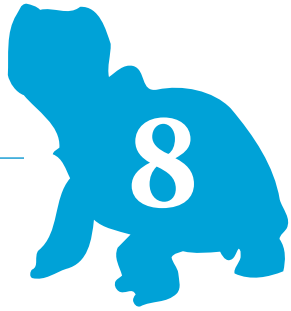
EXTENSION

Ask students to come up with ideas and ways that they can help keep the natural resource, water, safe.

by individuals and for commercial uses, too), that it originally comes from lakes, rivers, etc., and that it generally is sent to purification plants and on through pipelines to us. Emphasize the importance of not polluting the water sources in our communities.

13. Have students record the various sources of pollution they observed in their classroom river by drawing or writing on a "My Science Journal" page.

Detecting Air Pollution



Students create model air pollution detectors to sample particles in indoor and outdoor air.

A thin layer of air, a mixture of gases consisting mainly of nitrogen and oxygen, surrounds our planet. This layer is known as the atmosphere. It protects the Earth's surface from extremes of temperature and harmful radiation from the sun. All living things on Earth need air. Living organisms require oxygen to release energy from food and stored reserves. Plants and other producers also need carbon dioxide for photosynthesis.

When we breathe in air, we take in nitrogen, oxygen and tiny particles. Particles in air are pollutants and can be harmful. Air can become polluted or dirty in many ways. Indoor air contains tiny bits of dust made from animal dander, mold spores, dust mites and other materials concentrated inside living areas. Outdoor air can become polluted by car exhaust, other kinds of burning, manufacturing waste, soil and dust.

SETUP

Part 1: Obtain six 2-meter-sheets of butcher paper. Have students work in groups of four.

Part 2: Cut a 4½-in. x 6½-in. (12 cm x 16 cm) rectangle out of the center of two sheets of 9-in. x 12-in. heavy paper (making a picture frame set). Make 25 frame sets for students (one set per student, one set for demonstration).

Make 25 8-in.-strips (20-cm strips) lengths of wax paper to put inside and between each set of frame sheets.

Have students work in groups of four.

PROCEDURE

Part 1

1. Begin the class by darkening the room. Either let a shaft of light enter through a small opening in the blinds or shine a flashlight through the air. Ask students what they see. They should be able to observe small particles, "dust." Ask students, *What is air?* Help them understand that air is comprised of all the gases around us and it makes up our atmosphere. Ask, *Do we need air? What for?* (It is one of the things we need to live.) *How do we get air?* (We breathe it in and out of our lungs through our nose and mouth.) Ask, *Can we see air?* Expect varied responses (like wind, clouds, rain, snow, tornadoes, dust, smoke, bubbles, airplanes, etc.) that we observe when we look around outside. Project the page, "What's In the Air?" Discuss the different kinds of particles in air and match them to their sources (see "Answer Key to "What's In the Air?" sidebar, p. 24).
2. Have student work in groups to create a mural of things in the

CONCEPTS

- Air is all around us.
- Air in our atmosphere includes weather phenomena and flyers.
- Air is a necessity for life.
- Air can be polluted.
- Air can be cleaned or filtered.

SKILLS

- Observing
- Predicting
- Comparing and contrasting
- Communicating
- Counting
- Modeling

TIME

Setup: 20 minutes
Class: 2 sessions of 30 minutes

MATERIALS (see Setup)

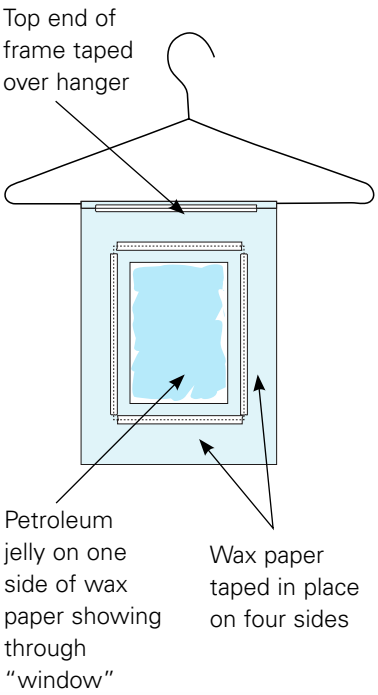
Teacher Materials

- 50 sheets of heavy, white or light colored paper, 9 in. x 12. in (to make "picture frames")
- Roll of wax paper
- Pair of scissors (or an X-acto knife, ruler and cutting board)

Materials per Student Group

- 4 coat hangers
- 4 hand lenses
- 4 pairs of scissors
- 4 plastic knives
- 4 sets of prepared "picture frames"
- 4 sheets of wax paper, 8-in. in length
- Construction paper in assorted colors and drawing paper
- Cotton balls
- Crayons and/or markers
- Glue
- Petroleum jelly, medium-sized jar
- Sheet of butcher paper, 2 meters in length
- Tape
- Copy of "What's In the Air?" and "My Science Journal" pages

AIR POLLUTION DETECTOR



ANSWER KEY TO "WHAT'S IN AIR?"

1. Spores are made by molds in damp places, like bathtubs.
2. Dust mites live in pillows and mattresses.
3. Pollen grains are made by flowering or cone-bearing plants. Pollen can be found indoors.
4. Tiny pieces of dead insects are in dust.
5. Flakes of dead skin are in the air.

EXTENSION

Have students make air pollution detectors to take home.

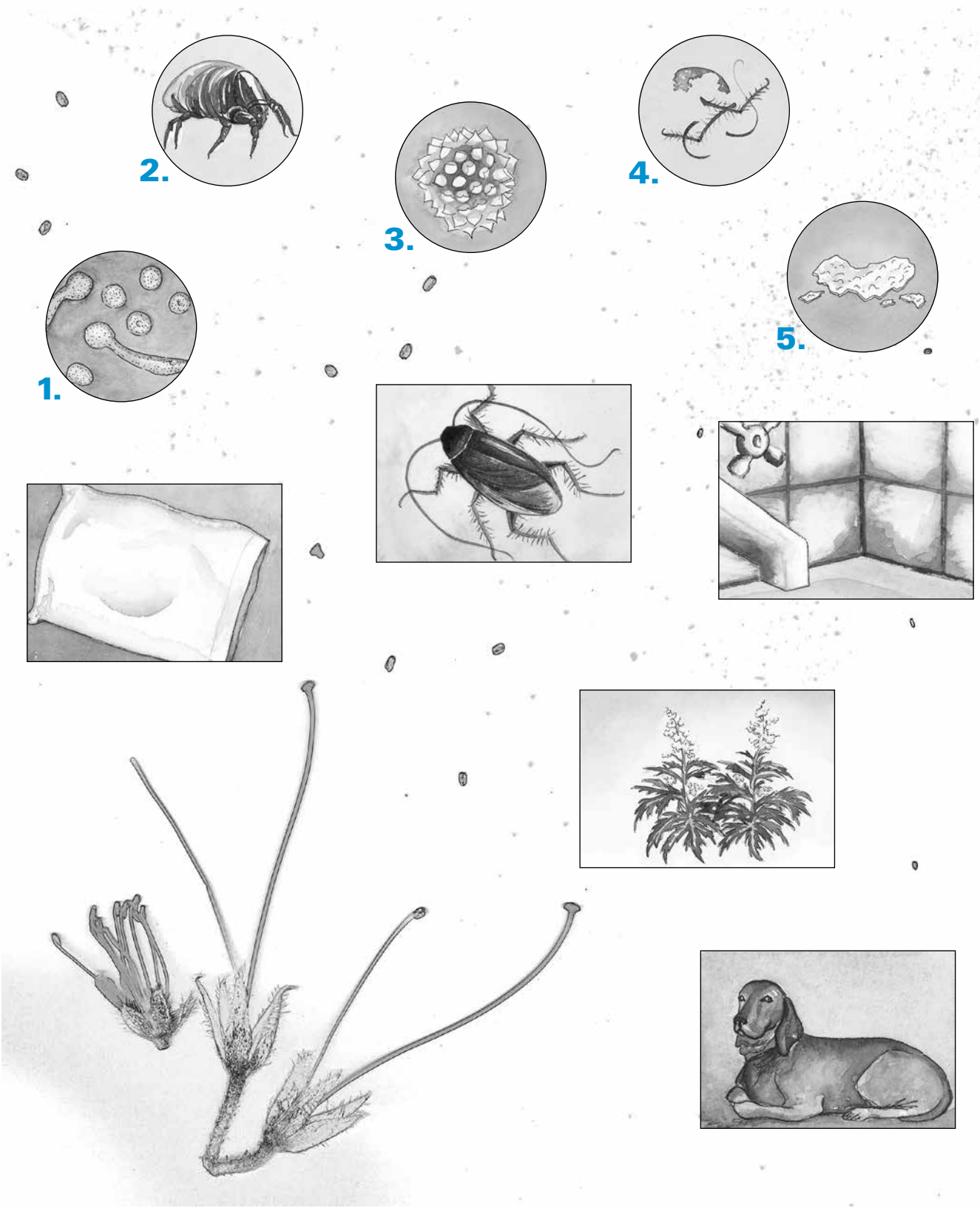
atmosphere (or air). Give each group a sheet of butcher paper. Encourage students to draw on the sheet, or make pictures using construction paper, scissors and glue to attach created items. When students have completed their murals, hang them on the classroom wall for class observation and discussion.

Part 2

1. Ask, *How can we discover what is in the air in our environment?* As students think about and discuss this subject, remind them about air filters on the cooling/heating systems at home and at school. (You may want to show them a filter.) Now explain that they will be making pollution detectors to check for dirt, dust or other particles that might be in the air in their homes or outside.
2. Distribute one set of two cut-out picture frames to each student pair and instruct students to draw pictures of things that might be in the air around the edges of the frames.
3. After students have finished decorating the frames, demonstrate how to place the wax paper between the frames and tape it into place on both sides. Tape the sides of the frame together.
4. Have students work as teams to put the frame and wax paper together.
5. Demonstrate how to attach the "Pollution Detector" (instrument) to a hanger by folding a small strip of the frame over the hanger and taping the frame in place.
6. Have students attach their pollution detectors to the hangers, then coat one side of the wax paper windows with petroleum jelly.
7. Instruct students to decide on a place to hang their detectors, inside or outside, considering factors such as weather, vents, doors and windows, etc. Then, in their science journals, have students draw pictures of their detectors in the environment in which they will be placed. Also have students draw what they think might become trapped on the sticky sides of the detectors.
8. Help students place their detectors inside the classroom or outside.
9. After a designated period, help students collect their detectors and examine the sticky surfaces using hand lenses.
10. Have students draw pictures of the different particles that have become trapped.
11. Ask students to bring their pictures to a sharing circle. Arrange students so that those with indoor samples will be on one side of the circle and those with outside samples will be on the other side. Have each student present one thing he or she has drawn and place the drawing on the floor. Consider creating a class graph on the floor using students' individual pictures.
12. Discuss students' findings as a class.

What's In the Air?

8



9

Where Do Animals Live?

Students listen and participate by filling in missing words as the teacher reads a silly poem about places where animals might live. The teacher should read and repeat the poem several times. Students draw pictures representing both their favorite nonsense lines from the poem and animals in more appropriate environments.

CONCEPTS

- Every living thing occupies a space within its environment.
- Most animals depend on the resources available within their environments to provide needed spaces.
- Humans depend on their natural environments, but they also construct places to meet their needs for safe, secure, comfortable spaces.

SKILLS

- Comparing and contrasting
- Communicating
- Identifying patterns
- Listening

TIME

Setup: 10 minutes
Class: 2 class periods

MATERIALS (see Setup)

Teacher Materials

- Copy of *Tillena Lou's Big Adventure* (available in PDF format in the Library section at http://www.bioedonline.org)

Materials per Student

- Crayons or markers
- Drawing paper

EXTENSION

Write more verses together and illustrate the new poems.

Although all animals and plants (and other living things) occupy physical spaces within environments, these spaces often serve different purposes from a human home. Plants are not mobile, so the spaces they occupy are determined by where the plant originally begins to grow. Plants survive in places that provide the necessary amounts of sunlight, water and nutrients, as well as protection from predators and disease.

Animals, of course, do move about. However, while a human needs a place to live—a home—many animals do not. Many animals build nests/places to raise their young and then abandon those places. Other animals, such as bees or prairie dogs, build large colonies that serve the needs of many individuals. Often, animal spaces are used for protection from predators. Humans, on the other hand, need places to gather, eat, sleep, feel safe, store their belongings and carry out social activities.

SETUP

Obtain a copy or copies of *Tillena Lou's Big Adventure* (see "Materials," right sidebar). Conduct this activity with the entire class.

PROCEDURE

1. Refer to the story, *Tillena Lou's Big Adventure.* Ask students, *What did Tillena Lou discover about the "people place" as compared to her environment?* Tell students that they will listen as you read a silly poem about places where animals live. They will follow the rhyming pattern to fill in the missing word and then make sense of the poem.
2. Read the poem to the students, leaving out the underlined words (last word of 2nd and 4th lines). Give the students opportunities to fill in the missing words as you read.
3. Give each student a large piece of drawing paper. Direct students to fold their sheets in half vertically. Encourage students to draw a picture of one of the animals in the poem in the "wrong" place and in the "right" place—on each half of the sheet. Or let students make up another ridiculous place for something to live and draw the two scenarios.
4. To get students started, you might ask them, *Does a fish live in a cereal dish? Why or why not? Could it ?*

Where Do Animals Live?

What if you were a frog?
Could you live on a dog?
Would you live on the road
if you really were a toad?

What if you were a fish?
Could you live in a cereal dish?
Would you live underneath the sea
if you really were a bumble-bee?

What if you were a bear?
Could you live here, there or anywhere?
Would you give a house a whirl
if you really were a squirrel?

What if you were a duck?
Could you live in a pickup truck?
Would you really live on me
if you were just a tiny flea?

But what if you're really just a kid?
Could you live with a purple squid?
Or would you live in an old brown shoe?
Would that really ever do?

It really all depends on you,
how you live and what you do.
But a kid's got to have a house.
Even if it is shared with a mouse!

10 Humans Design Their Homes

With a variety of materials, students create models of living spaces (houses) for people in different climates with different available resources; can compare the strengths and weaknesses of the different designs.

CONCEPTS

- Most animals require a safe place to rest, to eat or store food, and to reproduce.
- Animals use spaces that they can find and/or adapt natural materials for spaces or shelters.
- Humans use both natural and designed materials to create their living spaces, which serve many purposes.
- There is always more than one possible design to solve a problem.

SKILLS

- Listening
- Communicating
- Applying knowledge
- Inferring
- Identifying patterns

TIME

Setup: 1 hour
Class: 2-3 class periods

MATERIALS (see Setup)

Teacher Materials

- Copy of *The Three Little Pigs*
- Scraps of real building materials to show to students

Materials per Student

- Craft sticks
- Crayons and markers
- Drawing paper
- Glue
- Tape
- Lincoln Logs®, building blocks, sticks, leather or plastic, ice cubes, tent materials (fabric), or Lego® bricks

An "environment" consists of the space, conditions and factors that affect an individual's and a population's ability to survive and determines their quality of life. All living things occupy specific environments and, accordingly, they survive only in environments where their needs are met. Animals sometimes use resources in their natural environments to create living spaces ("places to be") that provide protection from predators or places to raise their young. Birds build nests from twigs, beavers build dens or lodges from sticks and logs, etc. Humans, however, make complex uses of resources to satisfy their needs. These uses include peoples' houses and most of the objects found within homes, such as appliances and furniture.

Houses around the world differ, based on available building materials and climate. Homes in cold areas must be constructed differently than homes in areas that are hot, dry, rainy, etc. One thing almost all houses have in common is that they are built from materials that are readily available or can be transported easily.

SETUP

You will need to check out a copy of *The Three Little Pigs* storybook from the library, find a video or text version of the story online, or make up your own version to recount to students. You also will need a variety of building materials to show to students. These can be obtained, with permission, at a building site, or possibly with samples from a hardware/home improvement center. Or you may be able to gather such items from around your house.

Collect building materials for student groups to use when creating their houses, such as Lincoln Logs®, building blocks, sticks, leather or plastic items, ice cubes, tent materials (fabric), or Lego® bricks.

PROCEDURE

1. Read or tell the story, *The Three Little Pigs*. Let students repeat phrases such as "I'll huff and I'll puff and I'll blow your house down."
2. Ask, *Is this really possible? Could it happen to your house? Why or why not? How is your house alike and different from the pigs' houses?* Encourage students to think about why their houses might be alike and different from the pigs' houses. Have students consider the availability of building materials and climate in determining how houses are built. Ask, *Why would the Inuit people build houses of snow and not wood? Why would inhabitants of the American Southwest build houses out of adobe bricks (made from clay and straw)? Why is your home made of lumber or bricks?*
3. Invite students to draw pictures of the three pig's houses and of their own homes.

4. After they have completed their drawings, ask students to name the materials used in building the different homes they drew. Encourage students to share what they know about house-building materials (for examples, steps made of concrete, exterior of building covered with brick/wood/stucco, windows made of glass, etc.).
5. Discuss the materials houses are made from in your area and in other regions. List or draw materials on the board.
6. Distribute pieces of the building materials you have brought to class to each student or group. Ask, *What might these materials be made from? What might they be used for?*
7. After the discussion, show students the craft sticks. Have the members of each group of students cooperatively plan and build a house of their own design. Each group should decide what kind of living conditions their house would provide and in what climate it would provide the best shelter.
8. Create a class chart to compare the different designs. Have students identify and compare the ways in which the different houses use resources and meet the needs of their inhabitants. Students will display their houses. Consider having students create stories about people who could live in the type of house that they constructed.

EXTENSION

Bring in large boxes for students to decorate as houses or cut windows and doors in very large boxes and allow students to play inside the boxes.

11 Developing an Object or Tool

Students learn how resources are processed or transformed to create objects used in everyday life. Using pictures, they sequence the process of making an object from beginning to end (tree to chair, cotton to couch, etc.), and learn how tools and objects are designed to perform a function or solve a problem.

CONCEPTS

- We use resources from the living and nonliving components of the environment to meet our needs and wants.
- Humans make objects from natural materials.
- Simple problems can be solved through the development of an improved object or tool.
- The shape of objects helps them function as needed to solve problems.

SKILLS

- Observing
- Gathering Data
- Sequencing

TIME

Set-up: 10 minutes to make copies and to cut out the cards
Class: One class period

MATERIALS (see Setup)

Teacher Materials

- 12 sheets of white cardstock
- 12 resealable, small plastic bags

Materials per Two-student Team

- Prepared set of Process Cards

Throughout history, people have created objects that meet particular needs or solve problems. Our homes and the items inside provide many examples of how things are designed and created to fulfill a need. Technology, the practical application of scientific knowledge (or knowledge about the how the world works), is reflected throughout the spaces in which we live, work and go to school.

SETUP

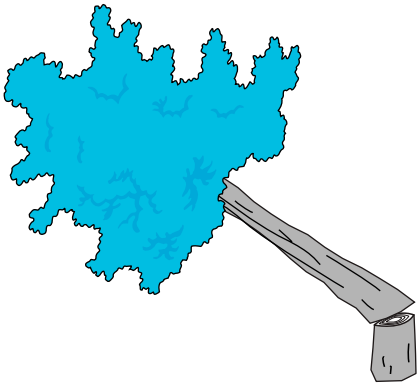
Each of the six student sheets contain a different set of steps (or processes) needed to create one object. You will need 12 sets of Process Cards for a class of 24 students working in teams of two. Photocopy the student sheets onto cardstock. Cut out the cards and place each set of cards in a plastic bag prior to class.

PROCEDURE

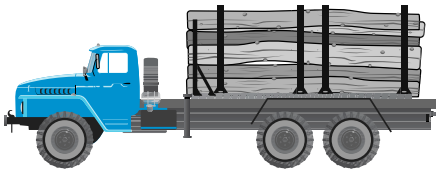
1. Distribute one bag of Process Cards to each student team.
2. Challenge students to place the cards in order, beginning with the first step. Ask, *Why is it necessary to make this item? Why do we need it? Does it make our lives more comfortable? Save time? Make a job easier? Could we get along without this item?*
2. As students finish a sequence, check their understanding and let teams trade cards with other groups.
3. Have students share their sequencing experiences. Ask, *Was the process involved in making any item more difficult or easier to figure out? How do you know you have the right sequence?*
4. Ask students to describe how the shape of each object contributes to its function. For example, the frying pan is convex, so that it can contain food; chocolate candies are small and round, so that they are easy to carry and eat, etc. Have each student think about a common object they use every day and sketch its shape.

Process Cards: Wooden Chair

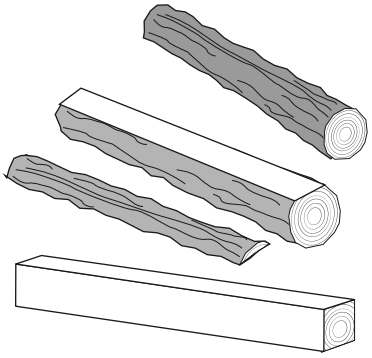
11



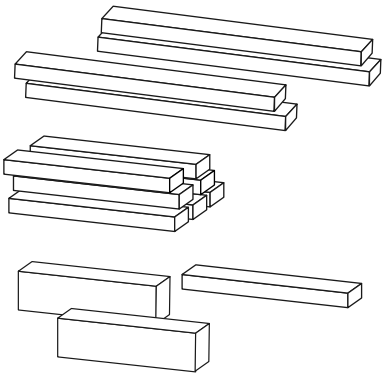
Cut down a tree.
Saw off the branches.



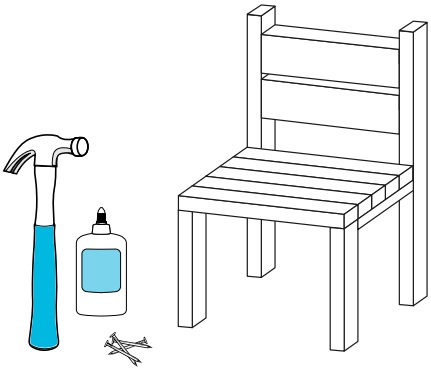
Transport the tree trunks
to a lumber mill.



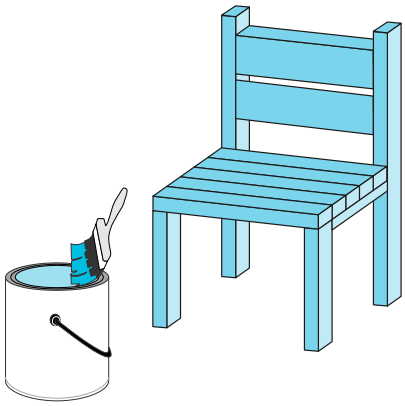
Saw the tree trunks
into boards.



Make different sizes and
shapes of the boards.

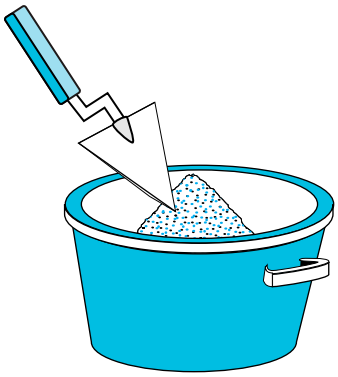


Use glue and nails to
put the boards together.



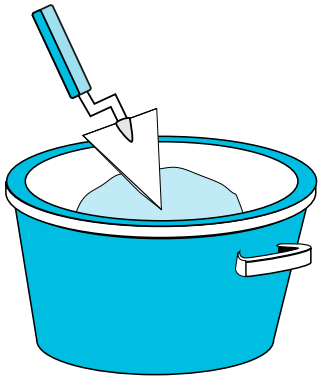
Paint the chair

Process Cards: Adobe Bricks

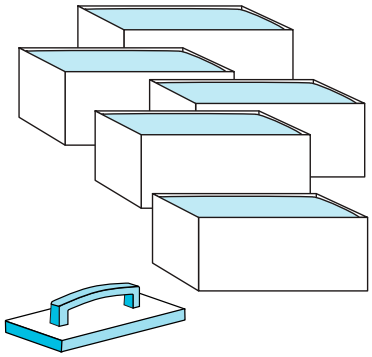


Mix fine mud and sand.

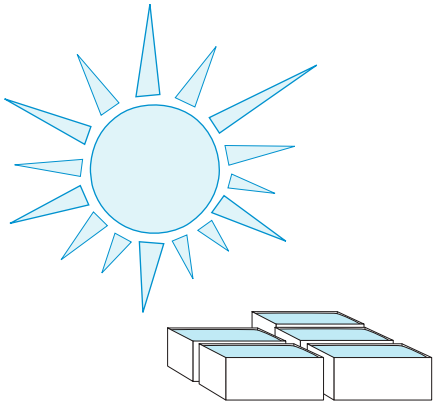
Add some water.



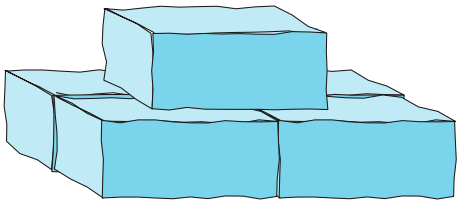
Mix until you can make a ball that sticks together.



Pack the mud mixture in boxes.



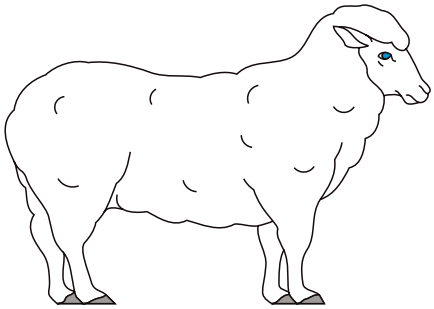
Let the mud dry in the sun.



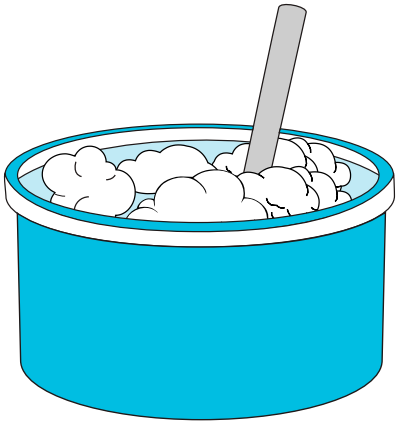
Remove the bricks from the boxes.

Process Cards: Wool Sweater

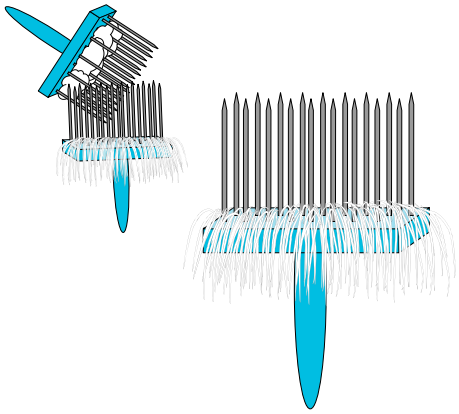
11



Shear the wool off of a sheep.

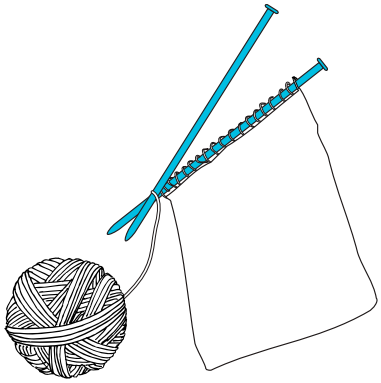


Wash the wool.

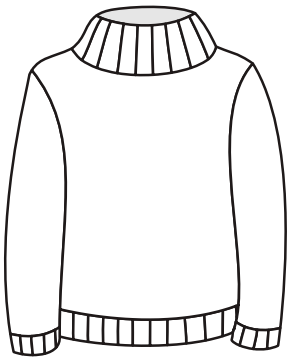


Comb the wool.

Twist the wool into yarn.

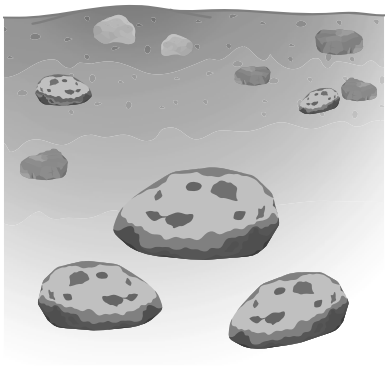


Knit the yarn
into different shapes.

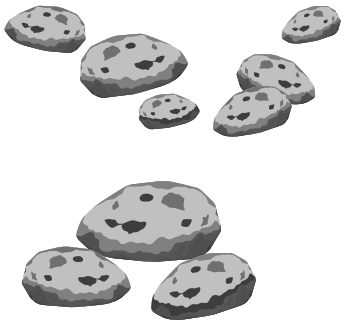


Sew the shapes together to
make a sweater.

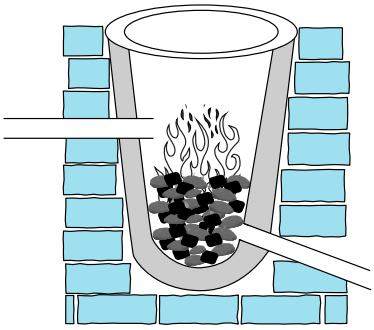
Process Cards: Frying Pan



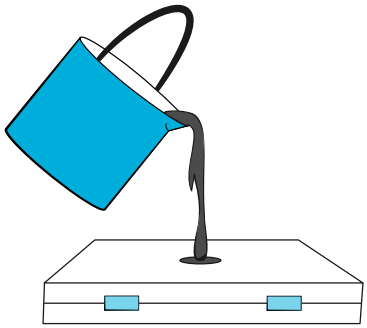
Locate minerals
in the ground.



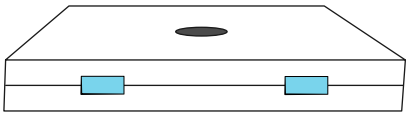
Take rocks with minerals
from the soil.



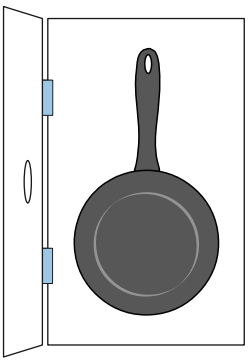
Heat the rocks in a furnace
to melt the minerals.



Pour the melted mineral,
iron, into a mold.



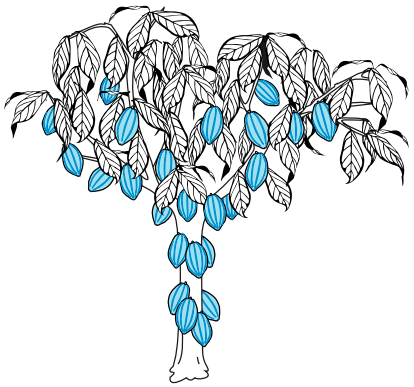
Let the melted iron cool
and get hard.



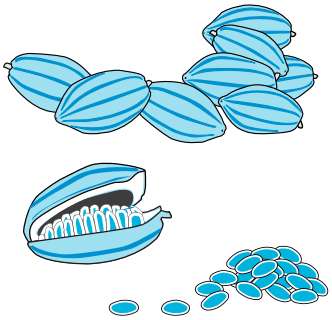
Open the mold.
Take out a new pan.

Process Cards: Chocolate Candy

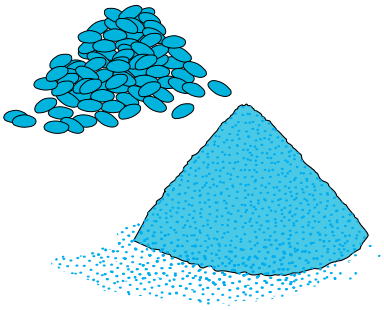
11



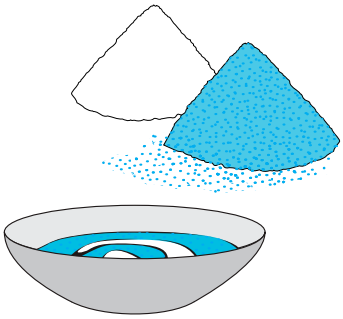
Pick the ripe cacao pods from the tree.



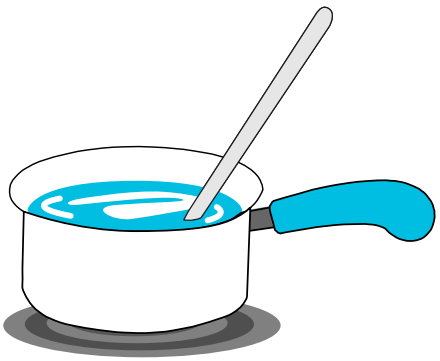
Remove seeds and pulp from pods. Let sit and ferment until the pulp sweats off the seeds.



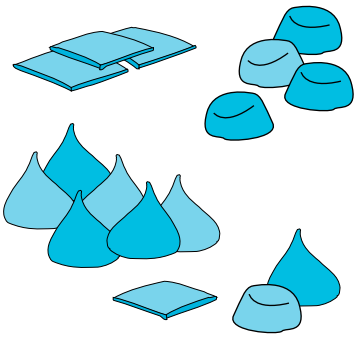
Wash the seeds and let dry. Grind seeds into a powder.



Mix the powder with cocoa butter and other ingredients.

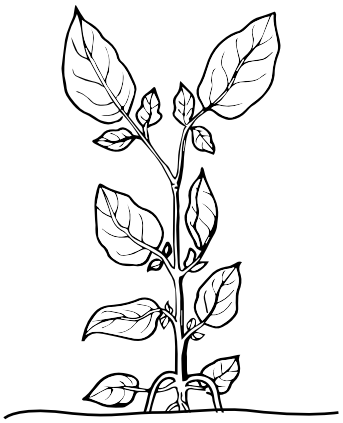


Place ingredients into a pot and melt to make chocolate.

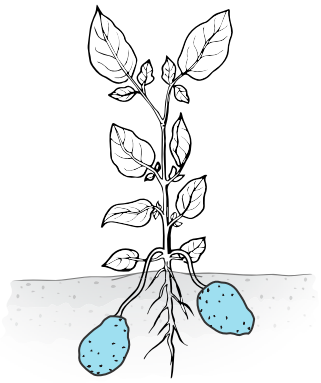


Shape or mold the melted chocolate into candies.

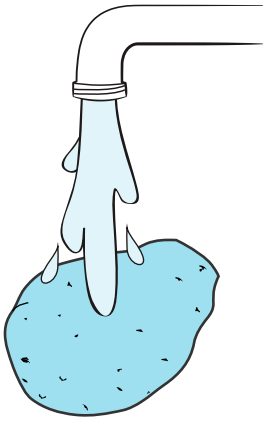
Process Cards: French Fries



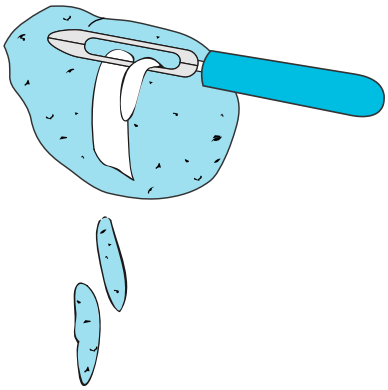
Grow a potato plant.



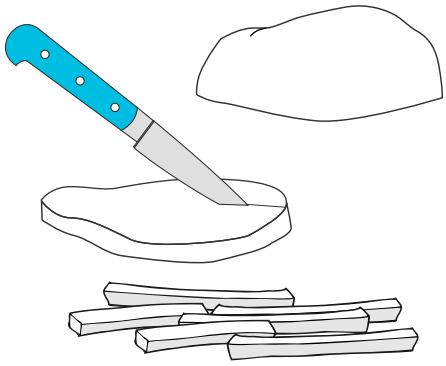
Dig up the plant to get to the potatoes underground.



Wash the potato.

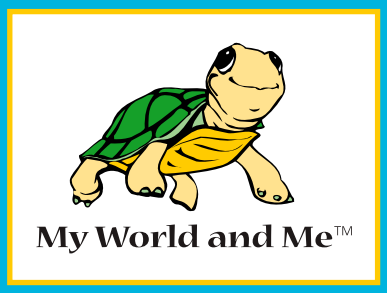


Peel the potato.



Cut the potato into strips.

Fry the potato strips in hot oil to make French fries.



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