WATER HERE AND THERE

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Give an oral or written definition of precipitation;
2. Tell at least two things that can happen to precipitation after it falls to Earth; and
3. Give an oral or written definition of the new terms: aquifer and water table.

SUBJECTS:
Language Arts, Art, Creative Movement

TIME:
1 hour (does not include prep time)

MATERIALS:
large paper grocery sack for each child
blue crepe paper
brown crepe paper

BACKGROUND INFORMATION

Precipitation is defined as water that falls to Earth in the form of rain, snow, or hail. Precipitation falls on all types of surfaces: water, mountains, grass, concrete and roof tops. Some of the precipitation evaporates, some runs down into bodies of water, and some seeps down into the ground and becomes part of the water table.

Terms

aquifer: porous, water-bearing layer of sand, gravel, and rock below the Earth's surface; reservoir for groundwater.

precipitation: water droplets or ice particles condensed from atmospheric water vapor and sufficiently massive to fall to the Earth's surface, such as rain or snow.

water table: upper surface of the zone of saturation of groundwater.

ADVANCE PREPARATION

A. Cut grocery sacks (one per student). Cut a hole in the bottom of the sack large enough for the student's head to fit through. Cut a hole in each (short) side of the sack for the arms of the student to fit through. (Sack should resemble a t-shirt.)

B. Use blue crepe paper wrapped around a circle of chairs to form a body of water.

C. Use brown crepe paper wrapped around a circle of chairs to form a representation of an area of ground.

PROCEDURE

I. Setting the stage

Share background information.

II. Activities

A. Give each student one of the prepared grocery sacks. Have each one draw a large raindrop on the front of the sack.

1. Have 1/3 of the class also draw a snowflake on the backs of their sacks.

2. Have 1/3 of the class also draw a hailstone on the backs of their sacks.

B. Divide the students into two groups. Each group should have some students dressed like rain, snow, and hail. Have one group stand behind the blue roped-off area and the other group stand behind the brown roped-off area. The snowflakes and hailstones should stand backwards so the pictures show. Read the narration prompting students' movements as they dramatize the lesson.

C. Narration:

"Water falls to the Earth in three forms: rain, snow, and hail. This is called precipitation. Sometimes precipitation falls into a body of water." (Have one group jump into the blue "body of water.")

"Snow and hail melt and become water. Sometimes precipitation falls on the ground." If enough precipitation falls to the ground, puddles may form. (Have part of the second group jump into the brown "ground" area.)

"Snow and hail melt and become water. Some of the water runs off down a slope." (Have one student slide out from under the roped area.)

"Some of the water seeps down through the ground (the students slowly squat), around rocks, and through soil and other rocks until it reaches a layer that is already filled with water. This layer is called an aquifer and the water in it is called groundwater. Gradually, the water in the puddles seeps down through the ground or it evaporates." (Have some of the students stand up slowly on the table.)

"Some of the water from the aquifer is pulled up through a well by pumps and is used by people. We all depend on groundwater and it should be kept clean."

III. Follow-Up

A. Have the students draw pictures showing precipitation and water seeping down to an aquifer.

IV. Extension

A. Tell your students, “The depth of the aquifer varies from place to place.” Ask, “Why do you think that is?” Discuss and extend the concept of precipitation.

RESOURCE

Groundwater Concern, Inc., 1794 Columbia Road, NW, Washington, D.C., 20009, 1984.

IT'S TIME TO CONSERVE

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Design (draw) posters on 8" x 10" paper for water conservation in the classroom;

2. Tell or write ways to conserve water around the home; and

3. Give an oral or written definition of the new terms: conserve, hydrologists, and hydrology.

SUBJECTS:
Science, Social Studies, Math

TIME:
30 minutes over a 2-day period

MATERIALS:
bucket
8" x 10" paper
pencils
crayons

BACKGROUND INFORMATION

Water is absolutely essential for life. All living things require water for survival. Water is one of our most precious resources and because of its importance in our lives, we must learn to respect it. Therefore, the practice of water conservation is an important concept to teach young children. The first step in teaching young children how to conserve water is helping them become aware of where water is used and how much water is used in daily living.

This lesson will help young children become aware of our limited supply of available fresh water. Much of this supply is found beneath the Earth's surface as groundwater. The lesson will help young children understand the impact we can have on the fresh water supply if we all conserve water by changing the lifestyle we have become accustomed to which depends heavily upon having plenty of clean water. Although there is plenty of water on Earth, it is not always available in sufficient quantity. Sometimes the quality is not adequate either. There is increasing evidence of chemical wastes improperly discarded in the past which are showing up in our water supplies today. The impact of everyone conserving water at home could mean the difference in health and the economic effects of a shortage of clean water in the future. There are many inexpensive ways to reduce water usage in and around school and home. We all need to practice conservation of water for a better future. See attached sheet for "Ways to Conserve Water."

Terms

conserve: to preserve and protect a natural resource from wasteful use.

hydrologist: a person that applies scientific knowledge and mathematical principles to solve water-related problems in society such as problems of quantity, quality, and availability.

hydrology: the science that encompasses the occurrence, distribution, movement, and properties of waters of the Earth and their relationship with the environment.

ADVANCE PREPARATION

A. Read the list of "Ways to Conserve Water." Explain that, during times of drought, groundwater supplies dry up. These take years to replace.

B. Copy "It's Time to Conserve" for each student after the sheets have been completed with the students' suggestions.

PROCEDURE

I. Setting the stage

A. Discuss the importance of conserving water at school. Ask students how they could conserve water around school. Have students help make a list of ways to conserve water and write their comments on the board or chart paper. Some suggestions: check water sources for leaks or drips; catch used drinking water to water plants; rinse paint brushes; and install water-saving devices for general washing duties in the classroom.

II. Activities

A. Using the list of ways to conserve water as suggested by the students, have students make 8" x 10" posters to display as reminders. For example if students have suggested cleaning out a classroom pet's cage once a week and using "used drinking water" for cleaning, have them or an adult write this on a poster or posters, then draw a picture or pictures. Display the poster in the location of the pet.

B. As the year progresses, students may think of other ways to conserve water. This is a good opportunity for students to make additional posters and display them. This is an ongoing process and may be continued throughout the year.

C. If you have students from rural communities, some may get their water directly from wells or springs. How do they safeguard their water supply?

III. Follow-Up

A. Discuss how families can conserve water around the home. Suggest ways from the "Ways to Conserve Water" sheet attached. Write students' suggestions on the board or chart paper.

B. Complete the "It's Time to Conserve" form by writing students' suggestions in the "Practice of Water Conservation" section. Have students draw pictures in the "Pictures of Practice" section to help them remember each suggestion. Each student will take his/her list home and have it completed with the help of their parents. Students will check in the section

"Practice we plan to use" section the practices they were able to complete at home and plan to use in the future.

C. When students return their completed lists, discuss what they found around the home and what they accomplished.

IV. Extensions

A. Create a weekly classroom job of Hydrologist. Explain the important role this person would play in the classroom, and have the students decide what this person might do.

B. If a leaky faucet is found in the school, have the students test how much water is leaking from the faucet. Set a bucket under the leak and catch the water that leaks for one hour or one minute depending on the leak. A faucet leaking 100 drops per minute can waste 350 gallons of water each month. Help students to determine how much water is being wasted each day or each year from the leak.

RESOURCES

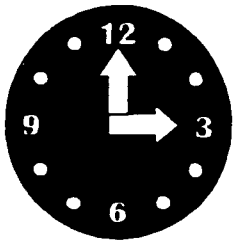
Carroll, Jack, Water Conservation Checklist For the Home, Mississippi Cooperative Extension Service, Mississippi State University, Mississippi, 1989.

Owen, Oliver S., Natural Resource Conservation: An Ecological Approach, Macmillan Publishing Company, New York, 1985.

Ways to Conserve Water

1. Inspect the plumbing system to see that there are no leaks and replace all rubber washers every 6 months.
2. Turn off all water if the building or residence is vacant for an extended period of time.
3. Never use toilets as trash baskets for facial tissue. Each flush uses 5-7 gallons of water.
4. Check to see how often water softening equipment regenerates and backwashes.
5. Wait until there is a full load for washing clothes or dishes in machines.
6. Set water level on machines at the lowest level possible.
7. Use energy saving levels as often as possible on washing machines and dishwashers.
8. Change into play clothes after school so that school clothes may be worn several times before washing.
9. Urge family members to take showers instead of tub baths.
10. Fit shower heads with flow restrictors or low-volume heads to use less water.
11. Limit showers to 2 to 5 minutes and keep water level at 5 inches of water for a tub bath.
12. Turn off shower water while applying soap to the body or while lathering hair with shampoo.
13. Use a pan of water when peeling and cleaning vegetables and fruits rather than letting the tap water run.
14. Limit the use of the garbage disposal to once per meal or use the disposal even less by saving food scraps for a compost pile.
15. Use the smallest amount of water necessary to cook vegetables and stews. It preserves nutrients as well as saves water.
16. Use tight-fitting lids on pans to prevent water from boiling away and also to cook food faster.
17. Wipe up small spills as they occur to avoid frequent mopping.
18. Do household cleaning chores together to save water.
19. Wash the car less often or take advantage of a spring rain to wash the car.
20. When washing the car, turn off the water while soaping.
21. Cover the pool when it is not being used to prevent evaporation.
22. Clean the pool filter often to keep from replacing the water as often.
23. Use a broom, not a hose, to sweep the garage, sidewalks, and driveway.
24. Install any water-saving devices that may be available in your area.
25. Put water-filled plastic bottles in the tank of all toilets to save water during flushes.

It's Time to Conserve



Practice of water conservation	Picture of practice	Practice we plan to use (check)
*		
*		
*		

AWAY IT BLOWS:
HOT SPRINGS AND GEYSERS

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Demonstrate, either orally or through activity, an understanding of the movement of water molecules;

2. Demonstrate, either orally or by simulation, an understanding of the pressure of hot water molecular movement and how it can cause an eruption;

3. Identify, orally or in writing, pictures of hot springs and geysers around the United States; and

4. Give an oral or written definition of the new terms: geyser, hot springs, and molecule.

SUBJECTS:
Science, Art, Cooking

TIME:
45 minutes

MATERIALS:
popcorn
popcorn popper (clear dome)
oil
construction paper
coat hanger
hot plate
pan

BACKGROUND INFORMATION

In some places, groundwater is near to underground hot volcanic material such as magma. As this water is heated up by the hot volcanic material, it rises to the surface and may erupt as a geyser. One of the most famous geysers is Old Faithful in Yellowstone National Park.

Hot springs are very much like geysers. They do not erupt but they flow to the surface. There are almost 1,000 hot springs in the United States. Sometimes they are used to produce electricity.

Terms

geyser: heated groundwater which erupts through the Earth's surface.

hot springs: heated groundwater that flows to the Earth's surface.

molecule: the smallest particle of a compound that can exist in the free state and still retain the characteristics of the compound.

PROCEDURE

I. Setting the stage

A. Review the states of water: solid, liquid, and gas.

B. Have students act out molecular movement for solid, liquid, and gas. Each student portrays a water molecule.

1. Solid - Students huddle closely together and barely move.

2. Liquid - The molecules begin to heat and students move a little bit more and separate slowly.

3. Gas - Students move rapidly and all over the room.

4. Compare the molecular movement of water in a solid to a group of people that are cold, they sit close together. When the group warms up, people move away from one another. (Liquid or gas, if students move far apart). Water is unique in that when in solid form, it occupies more space than when in liquid form.

II. Activities

A. Boil water - Ice water - Gas

B. Demonstrate an explosion caused by water heating and compare it to a geyser.

1. Explain to the students that popcorn kernels contain a drop of water. Ask students to describe what happens to water when it is heated/ (Demonstrate if necessary.)

2. Using a clear, domed electric popcorn popper, pop corn for the students. Note that, before the corn pops, precipitation forms on the dome. As more water turns to steam, the rapid pushing movement of the molecules causes the corn to explode or pop.

3. Relate the popcorn experiment to geysers.

III. Follow-Up

A. Illustrate water as a solid, liquid, and a gas. Show pictures that represent natural formations such as a frozen pond, a waterfall, and a geyser. Use a trifolded paper or a paper plate divided into thirds.

B. Create a mobile featuring famous water-related vacation attractions. Hang the pictures from a coat hanger.

IV. Extensions

A. Talk about other water attractions that are found in U.S. National Parks. Look at pictures

or videos of these tourist attractions. If you have access to a computer with an encycopedia, you can look up geyser on the encyclopedia and find some wonderful facts and pictures.

B. Many people believe hot springs can cure physical problems. Ponce de Leon searched for a Fountain of Youth. Ask, "Would you like to remain a child forever?" Why or why not?

RESOURCE

Meister, Teddy and Simpson, Ann M., Independent Study Enrichment Projects, Center for Applied Research Education, New York, NY, 1988.

OH WELL...- HOW WE GET WATER FROM THE GROUND

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Explain, orally or in writing, how water gets into an aquifer;

2. Demonstrate, orally or in writing, an understanding of how wells pump water from the ground;

3. Construct a model of a well; and

4. Give an oral or written definition of the new terms: aquifer, artesian well, groundwater, and well.

SUBJECTS:
Science, Language Arts

TIME:
1-2 hours

MATERIALS:
9-ounce cups or jars
large rocks (rinsed off)
small rocks
water
clay soil, top soil, or sand
clear plastic straws
paper cup with pin holes in the bottom

BACKGROUND INFORMATION

A well is a hole in the ground from which water can be withdrawn. Wells are dug in the Earth until they reach a zone of sand, gravel, or rock that is saturated with water. These zones are called aquifers. Wells work because water will flow from soaked sand, gravel, or rocks into holes. Sometimes electric pumps are used to pump water up the well.

Terms

aquifer: porous, water-bearing layer of sand, gravel, and rock below the Earth's surface; reservoir for groundwater.

artesian well: water forced up by hydrostatic pressure.

groundwater: water that infiltrates into the Earth and is stored in usable amounts in the soil and rock below the Earth's surface; water within the zone of saturation.

well: a bored, drilled, or driven shaft or dug hole; wells range from a few feet to more than six miles in depth, but most water wells are between 100 and 2,000 feet in depth.

ADVANCE PREPARATION

A. Gather materials for the experiments. The first experiment can be done with sand instead

of rocks. However, for efficient pumping of the water into the cup, use different size rocks rather than sand. The sand can clog the straw and make it difficult to trap water.

PROCEDURE

I. Setting the stage

A. The teacher should review what happens in the water cycle. Place emphasis on the 'accumulation' step of the cycle. Remind the students that water from rain and melting snow trickles down into the ground and is trapped below the surface as groundwater.

II. Activities

A. Construction of a model well

1. Place a clear straw into the 12-ounce cup and press it against the wall of the cup. Place about 1/4 cup of large rocks and 1/4 cup of small rocks into the cup.

2. Pour or sprinkle, from a paper cup with pin holes in the bottom of it, about 1/3 cup of water over the rock layers. Discuss with the class where the water accumulates (aquifer).

3. Now to remove the water from the aquifer, place a finger over the top of the straw. This will trap some water in the straw.

4. Release finger from the top of the straw and water should move into another cup.

5. Discuss how this experiment simulates a well by explaining how a machine, called a pump, is used to get water up from the ground.

III. Follow-Up

A. Students can construct their own wells and describe how they work in their daily journals.

B. The water added to the rock layers simulates rain. Discuss how various levels of rainfall affect a well.

C. Predict what will happen to the well if it doesn't rain for several days. Explain prediction. Test it.

IV. Extensions

A. Do this experiment again, but this time use clay soil, top soil, or sand instead of rocks. Describe the results. Determine which of the materials works best in a well.

B. Discuss flowing artesian wells and why pumps are not required to get the water out of the ground from this kind of well.

RESOURCES

Allen, Maureen, et. al., All About Water, Developed in cooperation with Dept. of Water Resources, State of California, 1992.

World Book Encyclopedia, Young Scientist, Vol 4, p. 72-73, World Book, Inc., Chicago, 1992.

WHAT'S THE POINT: POINT VS. NONPOINT

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Define, orally or in writing, point and nonpoint source water pollution;

2. Identify, orally or in writing, types of point and nonpoint pollution

3. Discuss and evaluate, orally or in writing, lifestyle changes to minimize the damaging effects on habitats;

4. Identify, orally or in writing, ways to prevent water pollution; and

5. Give an oral or written definition of the new terms: bacterial water pollution, conserve, erosion, fertilizer, nonpoint source pollution, point source pollution, sewage, and thermal pollution.

SUBJECTS:
Science, Language Arts, Math

TIME:
50 minutes

MATERIALS:
Verde Frog's habitat from Mudpuppy Pond Story (found in "Surface Water Chapter")
construction paper (red, blue, yellow, green, brown)
bucket, basket, or box
Mudpuppy Pond big book
student activity page
assortment of recycled materials: fabric scraps, wooden skewers, popsicle sticks, plastic lids, wood pieces
11 sheets of 11" x 14" chart paper

BACKGROUND INFORMATION

Water pollution originates from different sources: point sources and nonpoint sources. Nonpoint source pollution is water pollution which cannot be traced to any specific point or location. It literally comes from everywhere and is washed off the land into our lakes and rivers. Rainfall runoff carries soil, pesticides, and other residues of everyday human activity into our lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water.

Pollution contributed to water from a discrete source, such as a pipe, ditch, tunnel, or well, is referred to as point source pollution. Generally, pollution from point sources is controlled to some degree by federal, state, and local agencies. Wastewater treatment plants, storm drains, and factories are places associated with point source pollution.

Cleaning polluted water can be extremely expensive. Keeping pollutants out of the water in the first place is the best way to ensure clean water. Many individuals and industries around the country are taking steps to do just that. For example, some industries are reducing their production of toxic chemicals and developing ways to make their products without using toxic raw materials. Many people have switched to phosphate-free detergents and other less-polluting products. Also,

governments are passing tough water pollution control measures designed to prevent water pollution, from both point and nonpoint sources.

Terms

bacterial water pollution: the introduction of unwanted bacteria into a body of water.

conserve: to use a resource wisely and efficiently.

erosion: the wearing away of the Earth's surface by running water, wind, ice, or other geological agents by which material is removed from the Earth's surface.

fertilizer: natural and synthetic materials including manure, nitrogen, phosphorous, and treated sewage sludge that are worked into the soil to provide nutrients and increase its fertility.

nonpoint source pollution: pollution that cannot be traced to single point, because it comes from many individual places or a widespread area.

nutrient pollution: a nourishing contamination that causes unwanted plant growth.

point source pollution: pollution that can be traced to a single point source, such as a pipe or culvert.

sewage: waste and wastewater produced by residential, commercial, and light industrial establishment; typically discharged into sewers and sometimes into septic tanks.

thermal pollution: varying temperatures above or below the normal condition (e.g., a power plant turbine heated water); heat reduces the ability of water to dissolve oxygen; deep dams often let extra water flow downstream, when the water comes from the bottom of the dam, it is much colder than normal.

toxic pollution: pollution that kills living things.

ADVANCE PREPARATION

A. Cut two inch squares from red, blue, yellow, green, and brown construction paper. Use enough red, yellow, and blue squares for all of the students but two. Use one green and one brown. Students will get one square of colored construction paper.

B. Copies of pages 3-13 of Mudpuppy Pond story from "Surface Water Chaper" (8 1/2" x 11" size).

C. Copy student activity page.

D. Cut 11 sheets of 11" x 14" chart paper into water drop shapes. Glue a page from Mudpuppy Pond story on back.

E. Gather assortment of recycled materials for students to use to problem solve ways to prevent pollution from entering waterways.

F. Gather water pollution reference books from library.

PROCEDURE

I. Setting the stage

A. Ask the students, "What is pollution?" Tell students there are two types of water pollution, point source and nonpoint source, in the story Mudpuppy Pond. Write the words on the board.

B. To help students understand these two types, do this pollution simulation activity. Pass out one red, green, blue, yellow, or brown construction paper square to each student. (There will only be one square of green and one square of brown passed out). The squares represent different types of pollution. Tell the students to write the color of their "pollution" square on a piece of scratch paper. Then the students will place the "pollution" squares into a bucket (the pond). Mix the squares, then have all the students with red squares come up and pick out the exact pollution square they put into the bucket. Since all the red squares look alike, it is impossible to find the exact square. Have all red students sit together with pollution squares in the middle. Do this activity with all the colors until all "pollution" squares have been passed out.

Tell students that it is easy to point to the brown and green "pollution" squares. They are called point sources. Point source pollution can be traced to a certain pipe or culvert. Nonpoint source pollution comes from specific areas or the red group, blue group, and yellow group, but it cannot be assigned or pointed to one person or source. Nonpoint source pollution is caused by rainfall or snowmelt moving over and through the ground carrying pollutants with it. This type of pollution is hard to control because it comes from many different places with people and animals contributing to the problem. We all contribute to the problem without realizing it.

II. Activity

A. Prior to reading Mudpuppy Pond story again to the class, pass out the student Point/ Nonpoint Source activity page. Pause after reading each page for students to write a naming word that tells who polluted the waterway, recording it under the heading they believe is correct. After reading the story, discuss the various sources of pollution. Record the source under the correct heading on chart paper and discuss.

III. Follow-Up

A. Tell students each individual can play an important part in stopping pollution by changing certain everyday habits or by using the land responsibly. Brainstorm ways to prevent pollution from entering waterways.

1. Place students in 11 cooperative groups. Pass out chart paper. Have each group read its part of the story. Then, turn the sheet over and semantically map ways to keep pollution from getting into the water. The group may use reference books or brochures which have been placed in the classroom reference center.

2. Display each group's web on a bulletin board.

B. After gathering information, each group will use recycled supplies to correct problems in simulated Mudpuppy Pond community.

IV. Extensions

A. Make a chart with the three headings "Problems, Causes, Solutions," placed where everyone can see it.

B. Write and illustrate an environmental leaflet that addresses the causes and solutions to point source and nonpoint source pollution.

STUDENT RESOURCES

"Water Play," a 15-page color workbook for grades K-3. Connect the dots, decode messages, fill in the missing words, word search, color and more; these are all avenues taken in this workbook to teach children the basic ideas behind water-where it comes from, how to purify it, and how to conserve it. Order from: Innovative Communications, 207 Coggins Drive, Pleasant Hill, CA 94523, (510) 944-0923. Cost: $.50 each Student Workbook, and $2.00 for each Teacher's Guide.

RESOURCES

Hansen, Nancy Richardson, Controlling Nonpoint-Source Water Pollution, The Conservation Foundation, Washington, D.C., 1988.

Ranger Rick's Naturescope, Pollution: Problems and Solutions, National Wildlife Federation, Washington, D.C., 1990.

Water Quality: Potential Sources of Pollution, U.S. Geological Survey, Box 25286, Denver Federal Center, Denver, CO, 80225.

What You Can Do To Reduce Pointless Pollution, Alabama Department of Environmental Management, Water Division, Mining and Nonpoint Source Section, 1751 Congressman W.L., Dickinson Drive, Montgomery, AL 36109.

Point Source Pollution

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Nonpoint Source Pollution

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SOAK IT UP

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Sort the materials that will absorb into group;
2. Sort materials that repel water into a group; and
3. Give an oral or written definition of the new terms: absorb and repel.

SUBJECTS:
Science, Math, Music

TIME:
25 minutes

MATERIALS:
plastic medicine droppers for each child
plastic meat tray for each child
small cup for each child
water
two 2"x4" pieces of white paper for each child
3 plastic measuring cups
3 different sized sponges
test materials:
aluminum foil
plastic wrap
waxed paper
feathers
cotton balls
sponges
wooden blocks
paper towels
stones
cotton fabric
vinyl fabric or plastic sheeting
song "Ducks Like Rain"

BACKGROUND INFORMATION

Water soaks into many materials. These materials absorb water. There are a lot of materials that water will not soak in to. These materials repel water.

Terms

absorb: to take in or soak up a liquid.

repel: to not take in a liquid.

ADVANCE PREPARATION

A. Gather materials.

B. Cut the test materials so that each student has a piece of each material.

C. Give the students two 2"x4" pieces of white paper. Have them write "absorbs" on one and "repels" on the other. These are the category cards into which the students will sort the test materials.

PROCEDURE

I. Setting the stage

A. Sing the song “Ducks Like Rain” by Raffi. Explain the background information to the students.

B. Ask questions such as “Why do you think ducks do not mind being in the rain?”

II. Activities

A. Give each student a meat tray that contains a piece of each test material, a plastic medicine dropper, and a small cup of water.

B. Have the students test the cotton fabric by dropping water onto it and observing what happens. Sort the fabric into the correct category (absorbs).

C. Next put water on the plastic sheeting or vinyl material. Ask the students which they would rather use to make a raincoat, cotton fabric or plastic material. Have the students sort the plastic sheeting and vinyl materials into the correct category (repels).

D. Have the students test the remaining materials and sort them into the “absorbs” or “repels” category.

E. Discuss the conclusions after completing the activity. Ask the students what the advantages and disadvantages are of the various materials absorbing or repelling water.

III. Follow-Up

A. The following activity may be placed in the science center or done as a small group activity.

1. Put sponges in three different meat trays. Make sure the three sponges are different sizes.

2. Using a plastic medicine dropper, have the students add water to each sponge until it can hold no more and water gets in the meat tray.

3. Have a student squeeze the water from a sponge into a measuring cup. Do the same for the remaining two sponges.

4. Have the students compare the amount of water that each sponge held.

5. Have the students put the sponges and the cups of water in order from smallest to largest.

6. Discuss why some sponges held more water than others.

7. Relate the experiment to water absorption in the Earth and how some materials, such as sand, soak up water more quickly than clay.

B. Have the children test materials found in the classroom as to whether or not the material will repel or absorb water.

GROUNDWATER AND SOIL TYPES

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Examine and describe, orally or in writing, soils from different locations;

2. Compare, orally or in writing, soils from different locations;

3. Match, orally or in writing, identical soil samples; and

4. Give an oral or written definition of the new terms: clay, humus, loam, permeability, and porosity.

SUBJECT:
Science

TIME:
1 hour (may consider using 2 class periods for this lesson)

MATERIALS:
hand lens
8-ounce cups
shovel or trowel
newspaper
small spoons
paper
small bucket
plastic bags or baggies

BACKGROUND INFORMATION

Particles of rock and humus are the two main components of soil. It is the proportion and combination of decaying plant and animal parts, rocks, rock particles, fungi, and live animals that determine the texture and water retaining properties of soil.

Terms

clay: soil which consists of illite, kaolin, micas, vermiculite, and other mineral particles; clay particles are small and the spaces between them are small; clay soils absorb water slowly but can hold water longer than a sandy soil.

humus: organic soil formed from decaying organic material and mineral particles; most humus is black or dark brown, and holds large amounts of water.

loam: a fertile rich soil composed of varying amounts of silt, clay, sand, and humus.

permeability: the capacity of a porous material to transmit fluids; permeability is a function of the sizes, shapes, and degree of connection among pore spaces, the viscosity of the fluid, and the pressure driving the fluid.

porosity: the property of being porous, having pores; the ratio of the volume of minute channels or open spaces in soiled rock to the total volume of solid matter.

ADVANCE PREPARATION

A. Select several outdoor sites from which the students can take soil samples.

   1. If sandy, clay, and loam soils are not available on school property, samples may be provided for the students. However, the activity is most effective if the students can dig and examine at least one soil sample from the school grounds.

   2. Collect a bucket full of each type of soil because it will be used for three different activities.

   3. For the first activity, students need about one cup of soil from different locations. Cover the remaining soil and store it in a cool, dark place.

B. Prepare materials students need to conduct this activity (hand lens, shovel/trowel, sand buckets, newspaper, cups, small spoons, paper for drawing and writing a list, and plastic bags for storing soil samples).

C. Prepare student study areas. Cover tables with newspapers and pass out spoons, cups, and a hand lens for students to use in examining soil samples.

D. Prepare plastic bags by filling them with each soil type.

PROCEDURE

I. Setting the stage

   A. Have students compose a working definition of soil.

   B. Make a chart listing students' ideas of the contents of soil.

   C. Tell the students that they will be examining soil to see whether they can discover what it is made of and whether all soil is the same.

II. Activities

   A. Prepare to go outside.

      1. Give each group a sand bucket and a shovel or trowel. Tell each group where the preselected study sites are located and ask each group to choose a different site from which to dig a soil sample.

      2. Have each group of students go to its preselected site, dig a soil sample, and place it in the bucket.

   B. Each group should get a large cup of soil from its sand bucket.

1. Have students dump their samples onto their newspaper and examine the sample with a hand lens.

2. Students should sort the materials found in the soil into different cups. Put live animals in one cup, things that look as though they were once alive (plant and animal parts) in another cup, and rocks or pebbles in a third cup. Put the remaining soil in a fourth cup. If the students find any human-made materials they should put them in a separate cup.

3. Have the students further examine the soil by feeling and smelling it. They should also examine the particle size using a hand lens.

III. Follow-Up

A. Discuss the contents of each sample with the groups.

B. Help groups to list the contents they find in their samples.

C. Pass out blackline master "Soil Match."

1. Pass out plastic bags for soil samples. Be sure each group gets the sample it collected.

2. Have each group compare its sample with the identical soil samples labeled 1, 2, and 3.

3. The group will guess which sample matches its own, recording the guess. Students should work with the soil until they are comfortable with matching the samples.

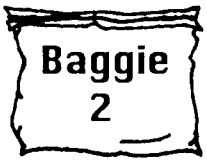
IV. Extension

A. Have students rotate from table to table examining each sample and making comparisons. The students will need experience with all three soil types to build background for future lessons.

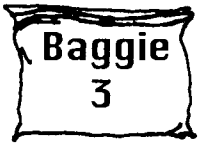
Soil Match

1. Guess which soil matches your sample. Circle yes or no for each bag.

yes no



yes no



yes no

2. Discuss what type of soil your group collected. Circle your prediction.

sandy clay loam

3. Compare your soil to the teacher's labeled samples. Did you answer correctly?

yes no

My soil is _____ .

DOES IT LEAK?

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Collect solid waste materials and tell, orally or in writing, how they can become liquid waste;
2. Create a model of a landfill;
3. Hypothesize, orally or in writing, about landfills leaking into the groundwater; and
4. Give an oral or written definition of waste.

SUBJECT:
Science

TIME:
two 30-minute days

MATERIALS:
deep clear plastic container
soil
clay
grass seeds
plastic tube
garbage
clear plastic
resealable plastic sandwich bags
chart paper

BACKGROUND INFORMATION

Wastes are discarded or unwanted by-products of human or animal activities. Waste, just like other matter, occurs in three forms: solid, liquid, and gas. In the United States, billions of tons of solid waste are created every year. This includes garbage, rubbish, old cars, dead animals, waste treatment sludges, and many other materials. This is often placed in landfills.

One big concern is the contamination of groundwater from these landfills. Liquid formed by the breakdown of the solids may leak into the groundwater and be toxic to humans.

Term

wastes: discarded or unwanted by-products of human or animal activities.

ADVANCE PREPARATION

A. Collect samples of solid wastes. Be sure to include food, plant materials, and other substances that will decay or breakdown to a liquid form.

PROCEDURE

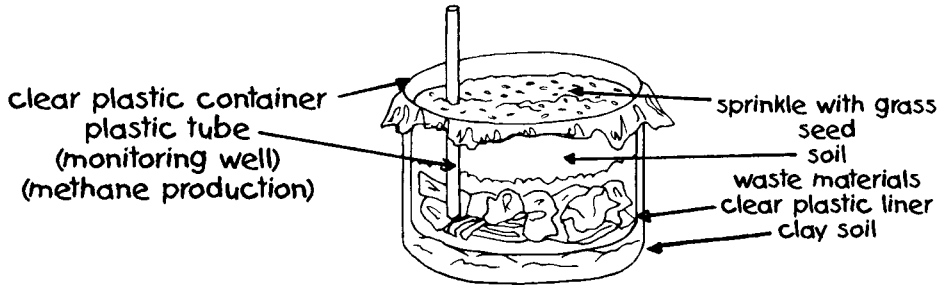
I. Setting the stage

A. Ask students to name things they throw away. On the board or chart paper, categorize them as solids or liquids.

B. Share background material, explaining that landfills are places in which solid wastes are buried.

II. Activities

A. Build a model landfill.



1. Container - represents the solid ground and shows that it is not touching the groundwater.

2. Clay - does not allow water to penetrate easily.

3. Clear plastic liner - most modern landfills are lined to prevent leakage.

4. Soil and grass - helps to keep animals from digging up the garbage, also for safety.

5. Monitoring wells (pipes) - help keep harmful gases controlled so that the landfill does not explode, Methane is a harmful gas often found at landfill sites.

B. Put selected garbage into resealable plastic bags; seal and tape to the window. In a few days, the liquid formation will be obvious.

1. Compare this to what is happening in the model landfill. Hypothesize about how liquid might leak out of the landfill and get into the groundwater.

2. Discuss how leaking or “leaching” of harmful wastes can be stopped.

3. Explain the differences involved in managing wastes.

III. Follow-Up

A. Hypothesize about what happens when the landfills are full.

B. Use similar waste materials for an art project. This emphasizes recycling and reuse of materials.

C. Discuss how to reduce the amount of waste taken to landfills.

IV. Extensions

A. Invite someone from the local landfill or an environmental organization to talk about landfill controls.

B. Teacher can discuss with students proper disposal of household cleaners, car oil, and other hazardous wastes.

RESOURCE

Waste: A Hidden Resource, Tennessee Valley Authority, Western Kentucky University, 1987.

THE BAD GUYS VS. THE GOOD GUYS

K-2

OBJECTIVE

At the end of this lesson, the students shall be able to do the following:

1. Distinguish, orally or in writing, between liquids which are harmful to people and liquids which are not harmful to people.

SUBJECTS:
Science, Art, Math

TIME:
45 minutes

MATERIALS:
2 pieces of construction paper
old magazines
scissors
glue
index cards
student activity page (included)
poster board

BACKGROUND INFORMATION

There are many products that we use in our daily lives which are perfectly safe when used or disposed of as directed. Window cleaner, nail polish, and gasoline are just three such items that can be harmful to people when used and disposed of improperly. When poured on the ground, they can get into our drinking water supplies and make people sick.

ADVANCE PREPARATION

A. Gather materials.

PROCEDURE

I. Setting the stage

A. Share background information.

B. Let each student say the name of some kind of liquid. Discuss and list it on the chalkboard under the heading "Harmful" or "Not Harmful." Optional headings might be "The Bad Guys" or "The Good Guys."

Here is a partial list of common household products which are potentially harmful to people when used or disposed of improperly:

bleach	furniture polish
window cleaner	bathroom cleaner

medicine	nail polish
hair spray	nail polish remover
antifreeze	car wax
diesel fuel	gasoline
motor oil	oil-base paint
rat poison	

II. Activities

A. Divide the class into two groups:

1. Using old magazines and/or labels from old bottles, let one group make a collage on a piece of poster board showing products which can be harmful to people. Also mount some harmful product pictures on index cards.

2. Let the other group make a collage on a piece of poster board showing products which are not harmful to people. Also mount not harmful product pictures on index cards.

B. Sit on the floor with the students. Place one of the collages on each side of you and stack the index cards in front of you. Let each child turn a card over, identify it, and place it on the appropriate collage.

III. Follow-Up

A. Give each student a copy of the student activity page. Have students make a prediction about which group had the most cards and mark their sheets. Show the cards one at a time, allowing time for them to color the graph spaces. Count and discuss. Mark the bottom of the sheet.

B. What do these products have to do with our water supply? How are they used?

IV. Extension

A. Read the warnings on some of these products. Are any of them poisonous? How should we store them, especially if there are toddlers at home? How should some of them be disposed of?

RESOURCE

"Cap a Chemical," The 3-5 Water Sourcebook, Environmental Protection Agency, Atlanta, GA.

I think my class made more:

_____ "harmful liquid" cards

_____ "not harmful liquid" cards

(check one)

"Harmful Liquid" cards	**"Not Harmful Liquid" cards**

My class made more:

_____ "harmful liquid" cards

_____ "not harmful liquid" cards

(results after counting and making graph)

HOW LOW CAN YOU GO?: THE WATER TABLE AND AQUIFER

K-2

OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Build a model of an aquifer;
2. Demonstrate, orally or in writing, an understanding of the zones associated with water tables;
3. Create a plastic bag book to illustrate the water table; and
4. Give an oral or written definition of the new terms: aquifer and water table.

SUBJECTS:
Science, Art

TIME:
45 minutes plus observation time

MATERIALS:
jar
sand
gravel
water (colored blue)
grease pencil or masking tape
ice
blue drink mix
impermeable paper

BACKGROUND INFORMATION

Without precipitation, groundwater could not form. Plants use some of the water that infiltrates the ground, but some of it moves down to an aquifer. At the bottom of the aquifer is rock through which water cannot pass. This is the impermeable rock layer. The downward movement of the water stops here. In an aquifer, the rocks are saturated with water. The top of the aquifer is the water table. The water table often follows the shape of the land. A spring may be found where the water table reaches the land surface. If groundwater is used faster than it is replaced, the water table will sink farther below the surface of the Earth.

Terms

aquifer: porous, water-bearing layer of sand, gravel, and rock below the Earth's surface; reservoir for groundwater.

water table: upper surface of the zone of saturation of groundwater.

PROCEDURE

I. Setting the stage

   A. Ask students, "Have you ever walked in a mud puddle? What did it look like and feel like?" Compare a mud puddle to a water table.

II. Activities

A. Simulating the Water Table.

1. Fill the jar with a mixture of sand and gravel. You may wish to use all gravel.

2. Slowly pour in blue water. Observe what happens to the water. Add until a section of the sand near the bottom of the jar is saturated.

3. Wait until all the water has had a chance to sink in. With a grease pencil or a strip of masking tape, mark the jar at the place that separates the saturated soil from the rest of the soil.

4. On a piece of paper make a diagram of the jar. Label the impermeable layer, the aquifer, and the water table. Suggestion: Do as a whole class once the individual pictures have been drawn. Discuss the meaning of each zone.

5. Put the jar on a window ledge and observe it each day for the rest of the week.

6. Relate the experiment to what happens underground.

III. Follow-Up

A. Does the water table change each day? Hypothesize about the changes. Can you prevent the lowering of the water table in the jar? Devise an experiment to check your hypothesis.

B. Make a drinkable water table using small pieces of ice and blue presweetened drink.

IV. Extension

A. Make a class plastic resealable bag book to illustrate the water table. Have the students work in groups to make each of the three pages. Use regular 8 1/2" x 11" paper.

1. Page one - write "grass"
   color green

2. Page two - write "dirt"
   (unsaturated zone)
   color brown

3. Page three - write "aquifers"
   draw rocks and color blue

4. Insert each page in a gallon-size resealable plastic bag. Stack the pages in order and staple together.

RESOURCE

Groundwater: A Vital Resource, Tennessee Valley Authority, Knoxville, TN, 1986.