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ABSTRACT

This instructional unit contains a set of nine lessons on energy for grade one. Each lesson contains complete teacher and student materials. Reading skills and language experiences are reinforced in each activity. The lessons cover such topics as energy from food, energy from the sun, fossil fuels, the wind, moving water, and energy conservation. The children examine things such as cereal grains to learn about food energy, make clay dinosaurs to get some idea about the formation time of coal, oil, and natural gas, and become part of a pinwheel parade showing the energy in wind. (BB)

U.S. Department of Energy

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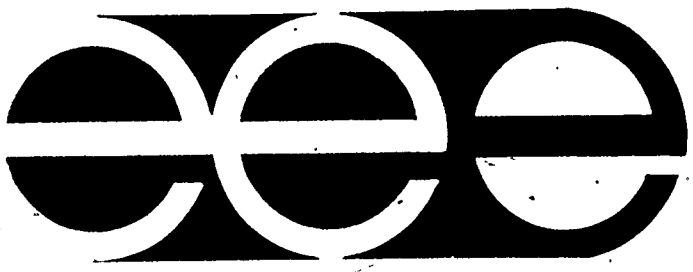

Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy

6
The Energy We Use
Grade 1

This material was produced by the National Science Teachers Association under contract with the U.S. Energy Research and Development Administration (now U.S. Department of Energy). The facts, statistics, and conclusions are those of the authors.

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The Energy We Use
Grade 1

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

This instructional unit was produced by NSTA's Project for an Energy-Enriched Curriculum under contract #EX-76C-10-3841 from the Education Programs Branch, Office of Public Affairs, the U.S. Energy Research and Development Administration (now U.S. Department of Energy). The NSTA project staff is as follows:

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"The Energy We Use" is the product of a writing session held at the University of Maryland during Summer 1976. The following teachers were the main contributors to this unit:

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October 1977
John M. Fowler
Project Director

The Energy We Use

Introduction

This packet contains a set of nine lessons that are closely related to the traditional curriculum for this grade level -- Me, My World. In this unit children discover that energy is one of the links between themselves and everything else. Here, in these lessons, children examine things such as cereal grains to learn about food energy; make clay dinosaurs to get some beginning ideas about the formation time of coal, oil, and natural gas; and become a part of a pinwheel parade showing the energy in wind.

Each lesson contains complete teacher and student materials. Reading skills and language experiences are reinforced in each activity. While it is suggested that teachers follow the sequence we have used, the order should be modified if it would better meet the needs of the students. A sequence and a glimpse of the student activity for each lesson follows:

Activity	Contents
1	Energy Provides Heat, Light, and Motion
2	Energy From Food
3	Energy Is All Around
4	Energy From the Sun
5	Fossil Fuels Have to Be Burned to Let Energy Out
6	The Energy in Wind
7	Energy in Moving Water
8	Energy Conservation
9	The Best Present of All

1. What is Energy?

Overview

This lesson develops an understanding of what energy is. It focuses on the fact that in order to have heat and motion, you have to provide energy.

Objectives

Students should be able to:

1. Demonstrate by running, jumping, and clapping, that through motion, heat energy is produced.
2. Explain that the heating source (radiator) in the classroom is also producing heat energy.

Background Information (Teacher use only)

This short lesson introduces the first grader to the nature of energy. The difficult concept of nutritional energy -- the flow of energy through the food chain -- is handled in a way children of this age can comprehend. The chemistry of burning -- utilizing fuel, oxygen, and heat -- is presented in simple experiments that children perform, e.g., jumping, running, etc.

In addition, we see this lesson as one that helps to clarify the sometimes difficult concept that energy is used to heat, light, and move things. The classroom radiator can be used to demonstrate motion energy as heat.

Teaching Strategies

Have children run around the outside school field or skip around the room until they begin to tire. Ask: How do you feel? Why do you feel warm and tired? *(You feel tired because you have been using a lot of energy. You used energy in your body to move and feel warm.)*

Have students put a finger in their mouths, or put a hand under their clothes on their stomach, or under their arm. How does it feel? Help children understand our body is constantly using energy to help us keep warm, move, and grow.

Let's look around the room. Who sees something in the room that moves or makes us warm? *(Clock, radiator, bell.)* Have a volunteer go to a conductor of heat and put his/her hand just above it. Ask: Can you tell the class what you feel, or what you might feel, if the heat were on? What do you think is making the air move or feel warm? *(Energy.)*

We have heat in our bodies. The radiator has heat. Is there anything else in our room that gives off heat? *(Lights should be suggested.)*

Clarify some beginning ideas about the nature of energy by leading a discussion. You might begin by saying: There are many things in the world that we know are there, because we see them. But there are some things we cannot see. Energy is one of those things. How do we know energy is there? Who can tell me a way? Children will probably suggest some of the following: *(a. We can run and jump. b. The radiator feels hot. c. The light fixture has light and heat.)*

Now close your eyes tight and imagine: If you could see energy, what would it look like? Now open your eyes and tell me what you saw. (Accept any answer the children give, since this question asks for an imaginative interpretation of the appearance of energy.) Ask children to close their eyes again and to imagine what energy feels like. (Accept all responses, but conclude the lesson with the idea that energy produces heat and motion.)

2. Energy From Food

Overview

This lesson develops the children's understanding that food is one of the sources of energy.

Objectives

Students should be able to:

1. Match various cereal grains with processed food that is made from these grains.
2. Recognize that when food is digested, it becomes a source of energy and that we need more food energy when we are more active.

Materials

Pencils
Paper
Crayons

Seed samples of wheat, oats, barley, rice, corn, millet -- each in a separate bowl.

Processed cereals: Buckwheat, Grapenuts, Shredded Wheat, Puffed Rice, Cheerios, Cornflakes, Rolled Oats. (Choose three or four from each group if you cannot get them all.)

Background Information (Teacher use only)

Food energy is found in nutrients (proteins, carbohydrates, fats, etc.). Energy is released into the bloodstream during the process of digestion. Sugar is released faster than the other food elements, but it is not the most nutritional. Food energy is measured in calories.

Teaching Strategies

An introductory type of activity would be to ask the children to look at the grains in the bowls. After a few minutes, ask them to describe each kind. What color is wheat (corn, oats, etc.)? How big are the cereal grains? Which are big? Small? What does wheat (corn, oats, etc.) feel like? Would you want to eat them? Do you sometimes eat them? Do you know what kind of grain each one is? (Help them to identify each one.) In what form do you eat this grain? (Wait for someone to suggest breakfast cereal, then place breakfast cereal boxes on the table letting children match each cereal with the grain it is made from.) Most cereal boxes have the grain

illustrated. The World Book Encyclopedia has pictures of grains.

Develop the lesson by asking: Do you eat cereal in the morning? Why do you eat it? *(Gives energy.)* What other foods give energy? (Let them name several different foods.) When you eat food, do you think about how your body changes it into energy? What do teeth do to food? *(Break up the food into smaller pieces.)* Where in our bodies do changes take place? *(Mouth, stomach.)* Show me where your stomach is. What happens to food in there? *(That's where the food gets changed to chemicals that go to the cells all over your body, where it's changed into energy.)*

Then say: Find your heart, and feel it beat. You will need to remain very quiet. When you feel it beat, stand up. Conclude this part when most of the children are standing. Then say: Let's do some jumping jacks together. Do at least ten. Now sit down and find your heart again and feel it beat. Is it beating slower or faster than before? Did you use more food energy when you were jumping? When you use up most of the food energy your body has stored, what do you think happens? *(You feel hungry, and you know it's time to eat again.)*

Summarizing the Lesson

Pass out newsprint folded in half, crayons, and pencils. Say: Think about your favorite food. On the left side of the paper, draw a picture of yourself eating your favorite food. On the right side of the paper, draw something you can do with the energy from that food. *(Run, jump, etc.)* If you can, write a sentence about your pictures. (Use the pictures for a bulletin board or language experience chart, or let the children take them home.)

3. Energy is All Around

Overview

This lesson reinforces the nature of energy as producing heat, light, and motion. An energy tour illustrates that energy can be found in many places in and around the school building.

Objectives

Students should be able to:

1. Identify three forms of energy.
2. Explain some of the ways energy is used in the school.

Materials

Paper with one or two lines at the top and bottom and space for a drawing between
Pencils
Crayons

Note:
In advance of the day's lesson, arrange with the school custodian for a suitable time to visit the boiler room. Plan with the cafeteria staff for an appropriate time to visit the kitchen. You may wish to arrange for a class visit to the school office and school library.

Background Information (Teacher use only)

Gas furnaces and gas ovens use chemical energy. When a fuel is burned, most of its energy is given off as heat.

Classroom lights use electrical energy. In incandescent lights, the filament or wire is made hot enough so it will radiate light as well as heat. Flourescent lights give off more energy as light and less as heat.

The telephone system uses electrical energy to give motion to the clapper that strikes the bell which in turn vibrates, producing sound. Sound is one of the examples of motion as a form of energy.

The refrigerator and air conditioner use electrical energy to extract heat from inside the container and discharge it to the outside.

In previous lessons, children learned that heat and motion are forms of energy.

Teaching Strategies

Activity 1: Prepare your children for any of the trips you take around the building. These places may be visited in any order. Be sure the children know they are to look for places where energy is being used. What you see will depend on your particular school building. Have them watch for things that produce motion, heat, or light energy. You may choose to use one or more of the following trips:

Boiler Room -- Children should notice the furnace and the hot water heater, water pumps and air blowers. Energy forms are heat, motion, and light.

Cafeteria -- Children should notice the ovens (heat), refrigerators (heat/cool), dishwasher (heat; motion), mixer (heat, motion), slicer (heat, motion), etc.

Library -- movie projector (heat, motion, light).

Office -- electric typewriter (motion), bell system (sound, motion), florescent lamp (light).

Activity 2: Following the trip, ask the children to choose one thing they saw on the tour and to draw it. They might print at the bottom of the picture the form of energy being produced -- heat, light, or motion.

Summarizing the Lesson

Make up some riddles to recall some of the energy users seen on the tours:

1. In the office we saw something that was on a desk, moved and used electricity. It was a _____. *(Typewriter.)*
2. In the library we saw something that used a light, had two spools that moved and used electricity. It was a _____. *(Projector.)*
3. In one room we saw something that uses oil and gives off heat. It was a _____. *(Furnace.)*
4. We saw something that gives off heat energy, has a light in it and uses electrical energy. It was a _____. *(Oven.)*
5. We saw something that has a round base, that twirls around and uses electricity. It was a _____. *(Floor polisher.)*
6. We saw something that uses electricity and makes a noise. It was a _____. *(Bell.)*
7. We saw something that was rectangular, uses electricity and makes things cold. It was a _____. *(Freezer.)*

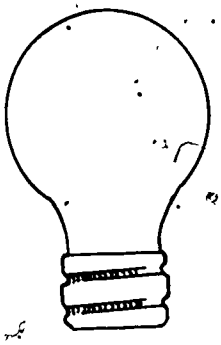
Supplementary Activities

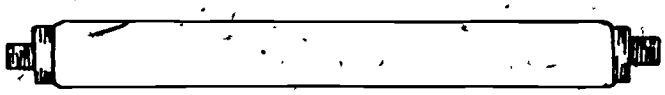
Review the facts concerning the forms of energy by playing a memory game. Tell the ~~children~~: To play this game you must repeat what I say and then add something of your own.

I went on an energy tour. I saw _____.

First student ..... a potato frying.
Second student ..... a furnace heating.
Third student ..... a boy jumping.
Fourth student ..... etc.

Extending the Learning





Ask the children to touch the florescent bulb. Does it feel hot? *(No.)*

Ask them to put their hands close to the incandescent bulb but not to touch it. It could burn them. Which bulb feels hotter? Which has the most heat energy? *(Incandescent bulb.)*

4. The Sun is a Source of Energy

Overview

We get energy from many sources. In this lesson children will learn about the sun as a source of energy.

Objectives

Students should be able to:

1. Identify the sun as a source of energy.
2. Write and/or tape a story about the sun.

Materials

Box of cereal
2 samples of the same kind of plant

Note:
A week in advance of the lesson put one plant in a dark place and a similar one in the light.

Background Information (Teacher use only)

The sun is a primary source of energy for all plants on the earth. Plants use energy from the sun to combine minerals from the soil with carbon dioxide from the air to make starches and sugar. The process is called photosynthesis. Today we can collect the sun's energy in photocells or in glass covered boxes which are blackened inside. The photocells convert the sun's energy to electricity. The energy absorbed in the glass covered boxes (which are called "solar panels") can be used to heat water flowing over them in pipes or tubes. This hot water can then be stored for use, or used to heat a home.

Teaching Strategies

A box of cereal may be held before the class. You may wish to say: I saw on TV a commercial for breakfast cereal. The announcer said that this breakfast cereal could give me energy. How could a breakfast cereal give me energy?

Another way of proceeding is to ask the children who have pets at home to stand. Do animals get energy from food also? (Call on each child who is standing.) Ask: What kind of pet do you have? What do you feed your pet? How does your pet use the energy in the food?

Begin discussing the following key questions:

If we get energy from food, and animals get energy from food, how do you suppose plants get energy? Are plants living things?

The sun gives light energy which is used by plants. Place the two plants in front of the class, the plant which was grown in the light and the one grown in the dark. Explain where each had been growing. Have the class observe differences. *(The one grown in the dark is likely to be taller and a light shade, whereas the one in the light will be a healthy green color, bushier rather than tall and straggly.)*

Compare the conditions for growth of the one in the dark with the one in the light. Bring out the fact that sunlight made the difference. Sunlight is necessary for the growth of most plants. We get light from the sun.

We also get heat from the sun. Did you ever get sunburned? If so, where did the heat come from?

Find other examples to show that the sun is a source of heat. Go outside and touch a wall that the sun is shining on. Now touch a part of the wall made of the same material but in the shade. Which is hotter? If your children are learning to use thermometers, measure the temperature of the part of the wall in the sunlight and that in the shade. Compare.

Block one pane of glass with black paper so that the shadow falls on the windowsill. Put one hand on the sill where the sun is shining and the other in the shaded portion of the window sill. Which is better? Why?

Summarizing the Lesson

Make a class story giving some facts you have learned about the sun. It might include these:

OUR SUN

THE SUN GIVES LIGHT.
THE SUN GIVES HEAT.
PLANTS NEED SUNLIGHT IN ORDER TO GROW HEALTHY.
BOYS AND GIRLS NEED SUNLIGHT.

5. We Use Fossil Fuels

Overview

This lesson begins the development of an understanding of fossil fuels - coal, oil, and natural gas - as sources of energy. It focuses on the concept that these are non-renewable resources; once used they are gone forever.

Objectives

Students should be able to:

1. Identify three fossil fuels: coal, oil, and natural gas.
2. Recognize the many ways we currently use fossil fuels.
3. Make a print to demonstrate how fossils are formed.
4. Recognize that, when used up, fossil fuels are completely gone.
5. Infer that coal is needed for producing electricity. (In lesson 7 we explain that water power can also be used.)

Materials

Pictures
Crackers in a plastic bag
Samples of oil, coal, or coke
String
Scissors
Crayons
Paste
Blue construction paper
Black construction paper
Paper punch
Milk cartons

Background Information (Teacher use only)

Coal, oil and natural gas are commonly called fossil fuels because they were formed from the fossil remains of ancient plants and animals over millions of years. Fossil fuels must be burned before energy can be released. Once burned they are gone. This energy is non-renewable.

Coal is found underground all over the world. It

is collected through mining and transported by railroad car, truck, barge or freighter. Heat from burning coal is used in many industrial processes such as in making steel. Coal heat is also used to run electric power plants. The coal heats water to form steam which turns the turbine and generates electrical energy.

Oil found under the ground and under the sea is collected by drilling, and transported by pipelines and in oil tankers. Oil has many uses. It is burned in diesel engines, in trains and in trucks. It is converted to gasoline and used in cars. It can also be used to provide heat energy to run electric power plants.

Natural gas is found in underground wells, is collected by drilling and transported by pipe lines and gas tankers and stored in tanks until used. Natural gas is burned in furnaces and stoves in homes, offices and factories.

Teaching Strategies

Activity 1: Use the pictures showing the kitchen and the outdoor picnic scene (Pictures 5-1). Ask the children to find things in each of the pictures which give off heat or light. Color these orange. Save for future use.

Discuss where the heat or light comes from. Their answers will probably be electricity, which usually uses water or coal for power; gas, referring to natural gas; or coal. Discuss the fact that these have to be burned to give off energy.

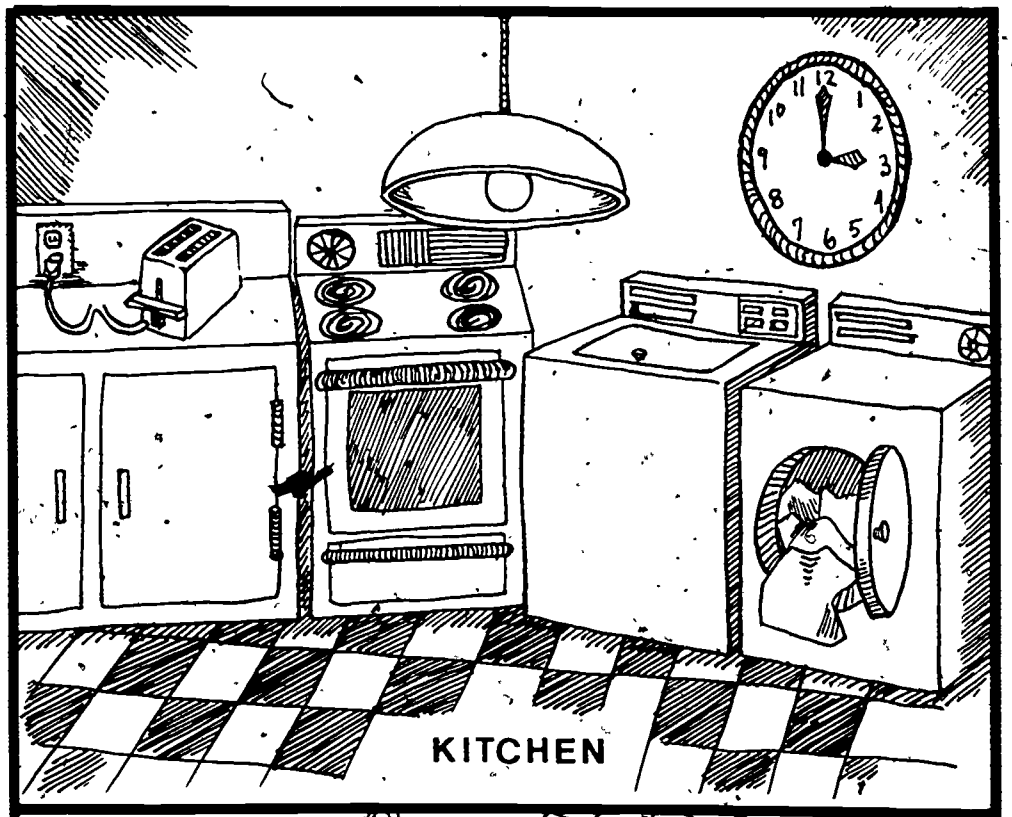
Activity 2: Help the children recognize that coal is often used in power plants to make electricity. Cut out the parts on illustration 5-2a and b to build a power plant with its accompanying coal pile and power lines. You can make this simpler or more complex depending on the ability of your class.

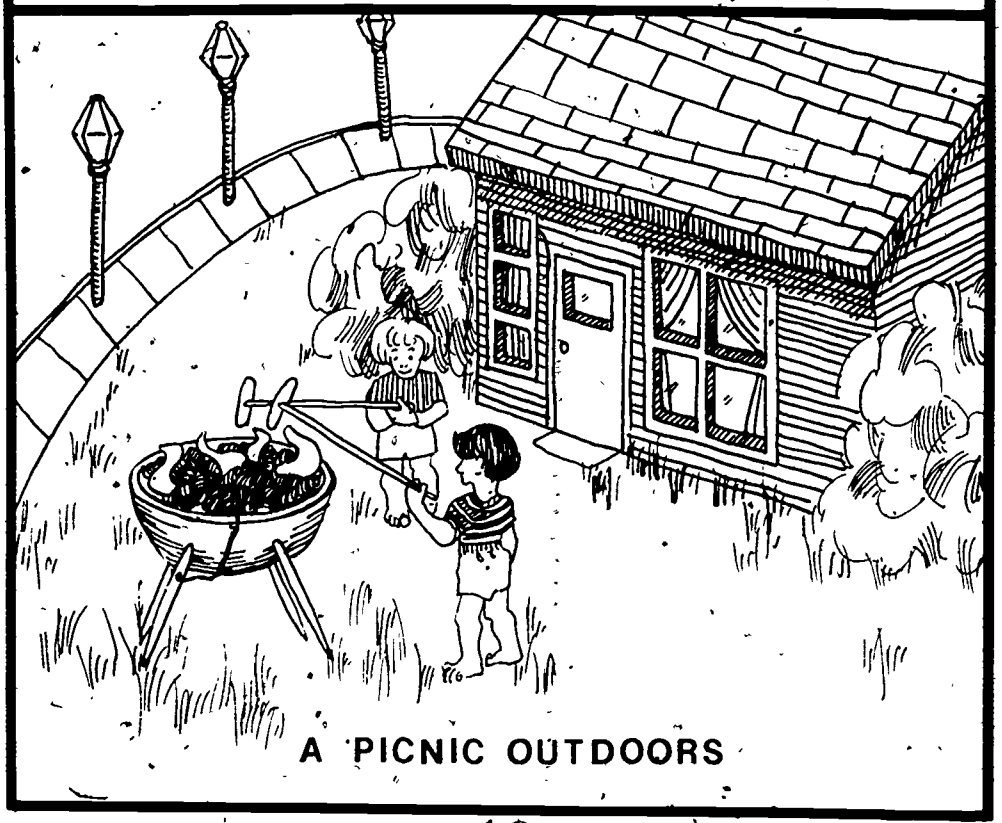
Have your class work individually or in small groups. Duplicate the plans for the generator (5-2a and b). Have the children cut out the parts. Fold on the broken lines and fasten together by putting paste on the tabs.

Some group might tear small chunks of black paper and pile these "pieces of coal" beside the generator to make a coal pile. Others can make a dam to represent water power as the source of energy.

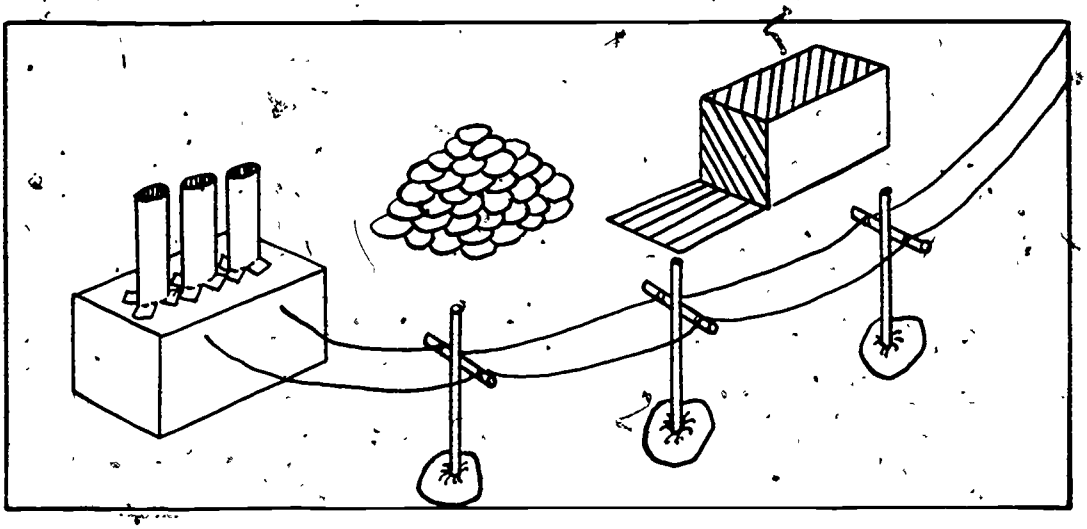
The thicker rectangular pieces can be rolled to make the smokestacks. Cut up on the lines and bend outward on the broken lines to make tabs to fasten the smokestacks on the roof of the power plant.

Which give off heat or light?
Color them orange.





Roll up the telephone poles, put holes in the top with a small-hole punch, and string electric wires from the plant to the poles and on to any simple milk carton houses you might devise. The poles can be kept upright by inserting one end into a clay base.



Activity 3: In picture 5-3 find things that need gasoline or oil in order to move. Put a circle around them.

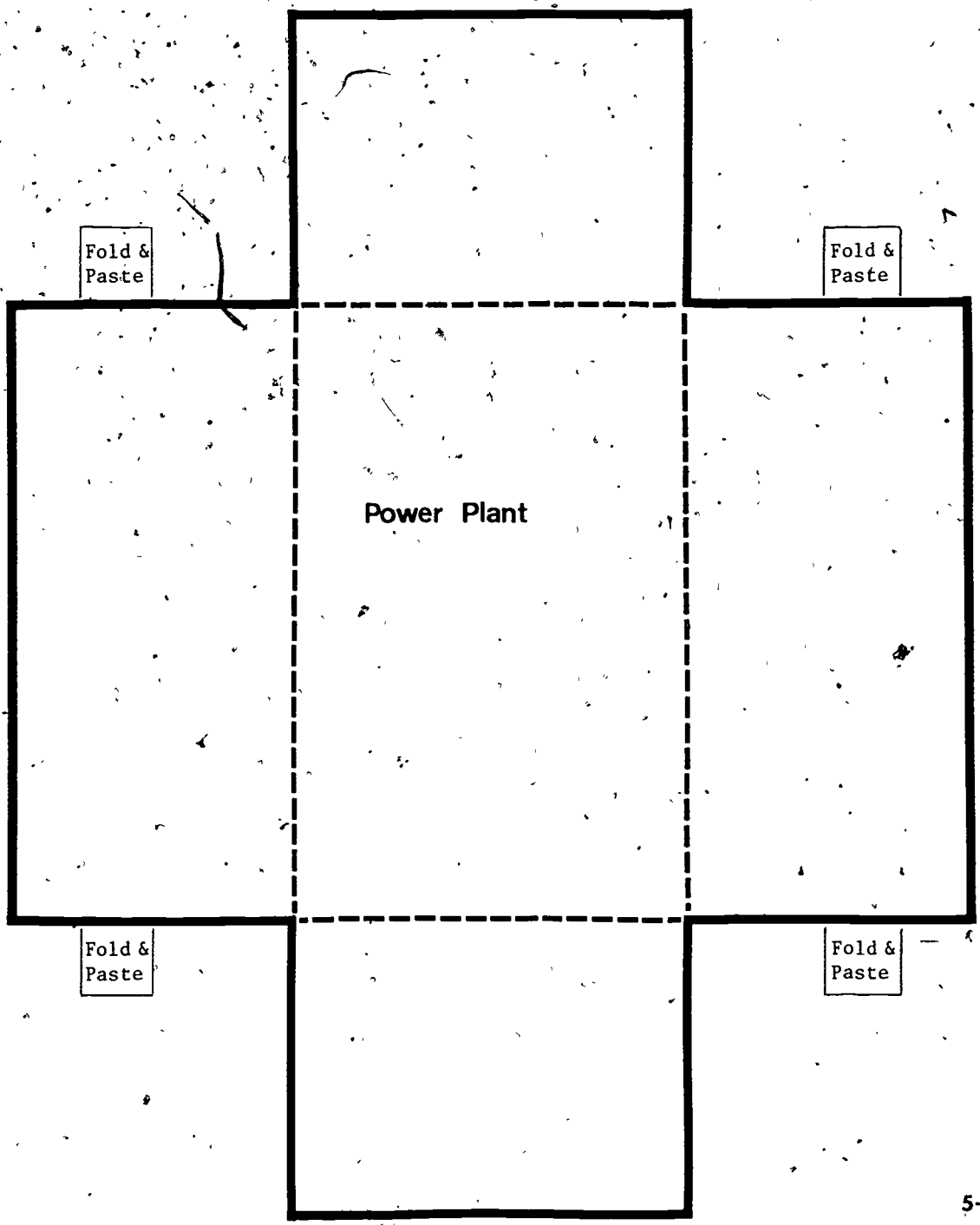
Explain to the class that gasoline is made from oil which comes from the ground. Oil is a fossil fuel.

Telephone pole

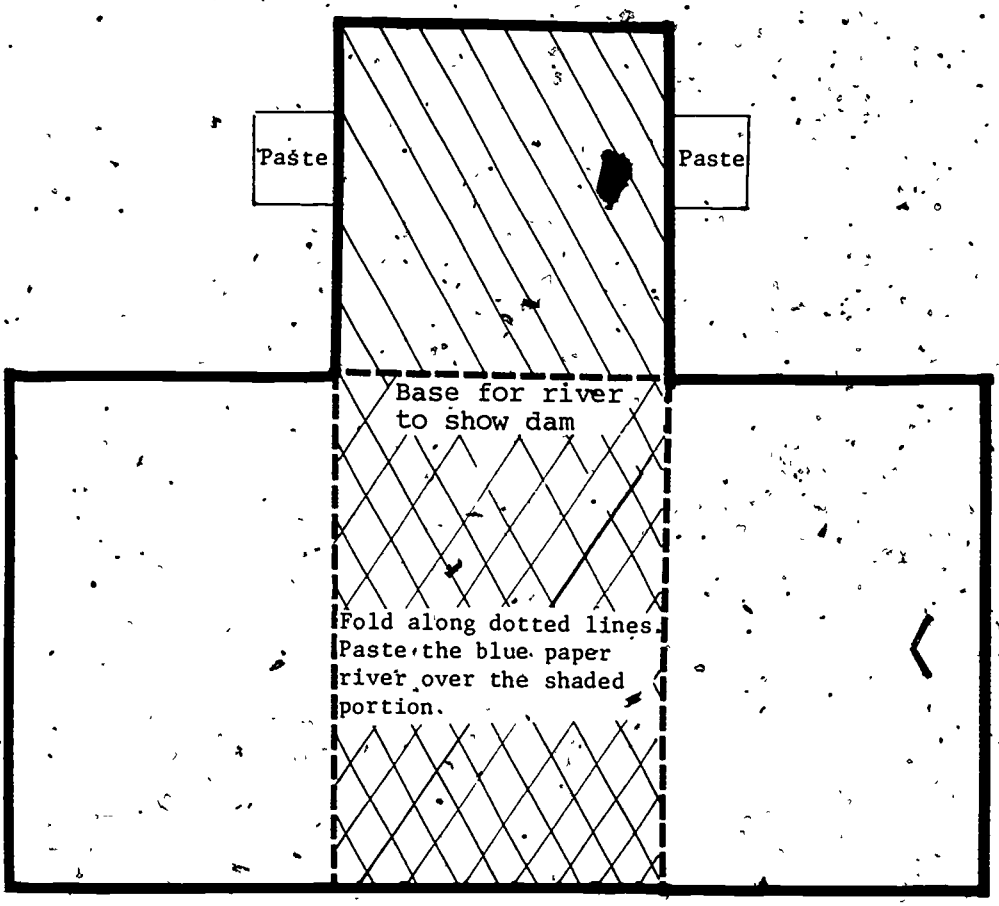
(Roll and put into clay base)

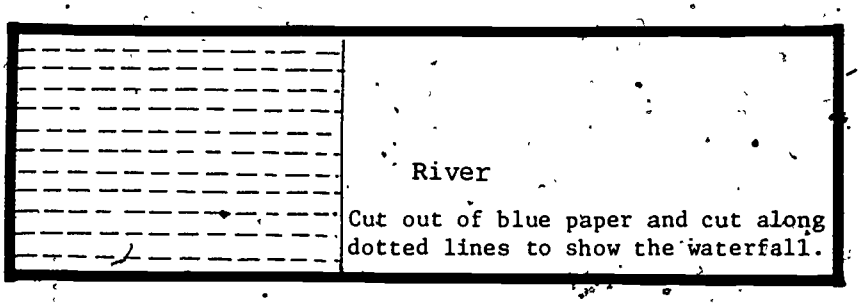
Utility pole

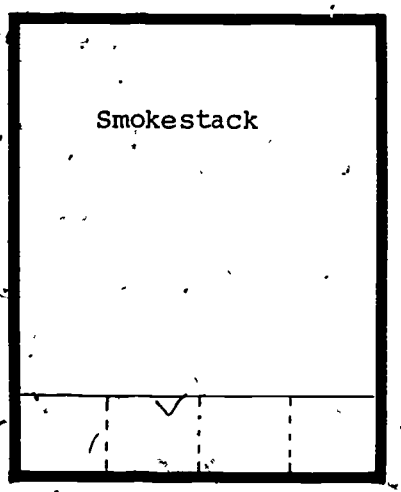
(Roll and put into clay base)

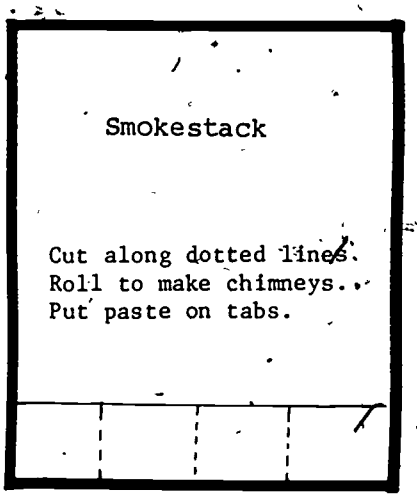


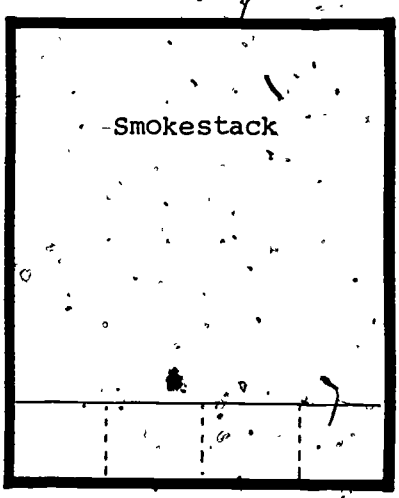
5-2a


Paste
Paste
Base for river to show dam
Fold along dotted lines. Paste the blue paper river over the shaded portion.


River
Cut out of blue paper and cut along dotted lines to show the waterfall.

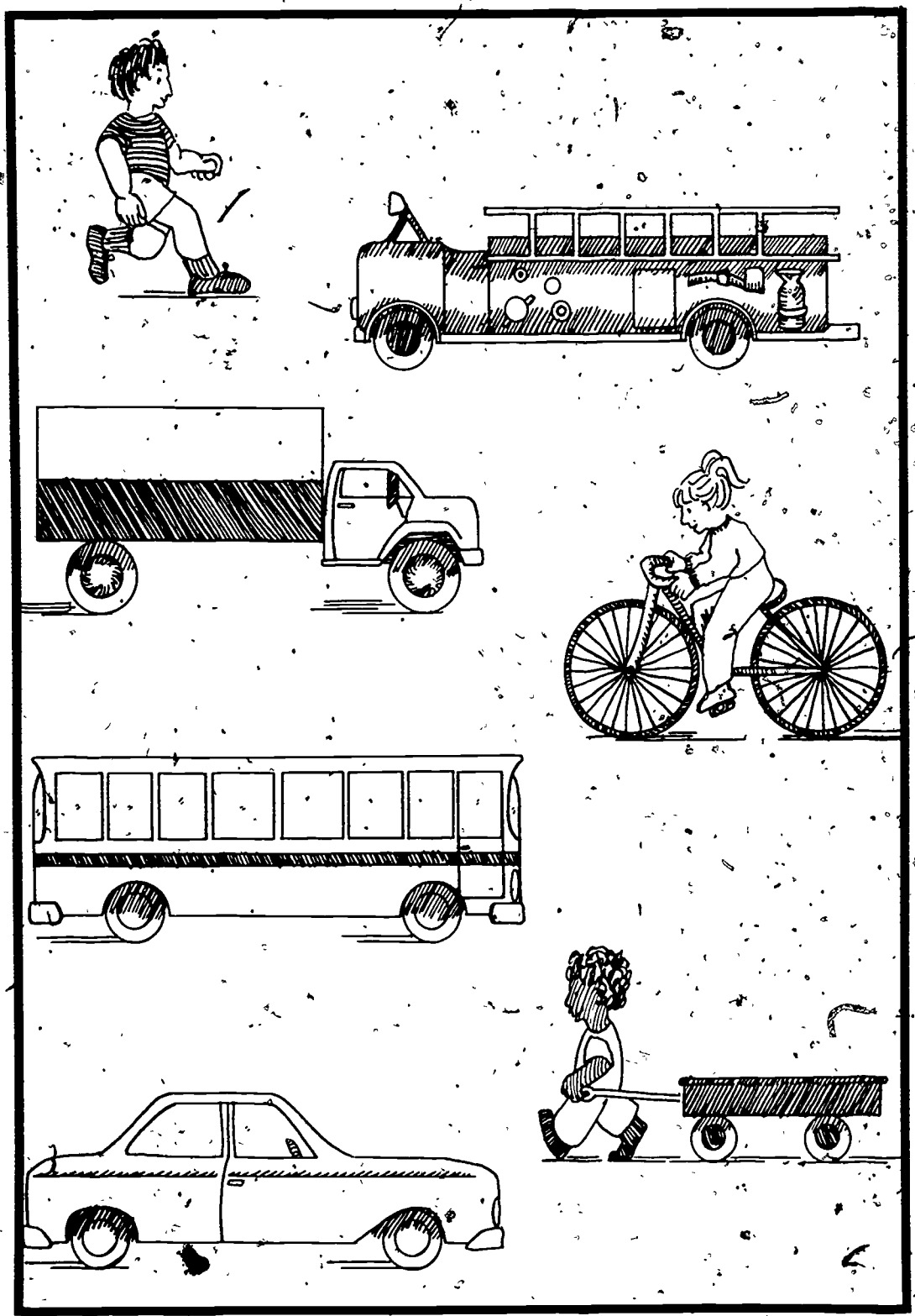

Smokestack


Smokestack
Cut along dotted lines.
Roll to make chimneys.
Put paste on tabs.


Smokestack

5-2b

What things need gas or oil to move?
Circle them.



J.5-3

Activity 4: Coal, oil and natural gas are called fossil fuels. These fuels were formed long ago before people lived on the earth. At that time the earth may have looked like the picture 5-4.

Long ago these plants and animals lived and died and fell to the ground. More and more of these large trees grew, and they in turn fell to the ground and covered the first ones. Sometimes the land sank and was covered with water and at times it would rise again. More and more trees grew in the swampy forests, only to fall too as they grew old and died.

Through the ages the materials on top became heavier and heavier and the plants and animals were pressed harder and harder. Gradually they changed into coal, oil and natural gas. This process took millions and millions of years.

Since this all happened before there were people on the earth, how do we know about these plants and animals which lived so long ago? Sometimes they leave records. These records are called fossils.

Examine samples of oil and coal and remind the children how long ago this was made. Once used it is gone forever. We cannot get it back. We say it is non-renewable.

Activity 5: Place two crackers in a plastic bag. Let the class examine the crackers. Then have a number of children eat up the crackers. Look again at the plastic bag. All the crackers which were in the bag are gone. Those two crackers are gone forever. In a similar way, we have a certain amount of coal, oil and gas on the earth. When we use it up, it is gone forever. We say that our coal and oil and natural gas are non-renewable. Once used up they are gone forever.

Burn a candle in an aluminum pie pan. Feel the heat energy. Observe the light energy. Once the candle is completely burned down, its energy is gone - it is used up.

MANY, MANY YEARS AGO

5-4

Activity 6: On the pictures used earlier (5-1) cross out, using an X, those things we could not use if we had no oil, no gas or no coal (charcoal). The pictures on 5-5 show what Johnny and his mother did last Sunday. If we have no coal, no gas and no oil next Sunday, which of these activities would they be unable to do? Cross a line through them.

Summarizing the Lesson

1. Think of some of your daily activities. If we had no gas, no coal and no oil, which would you have to stop doing? Draw a picture to show which one you would miss the most.

   Put a C (or color black) in the corner if you have to have coal or coke for this activity.
   Put an O (or color orange) in the corner if you would use oil or gasoline.
   Put an E (or color blue) if you would need electricity.
   Put a G (or color green) if you would need natural gas.

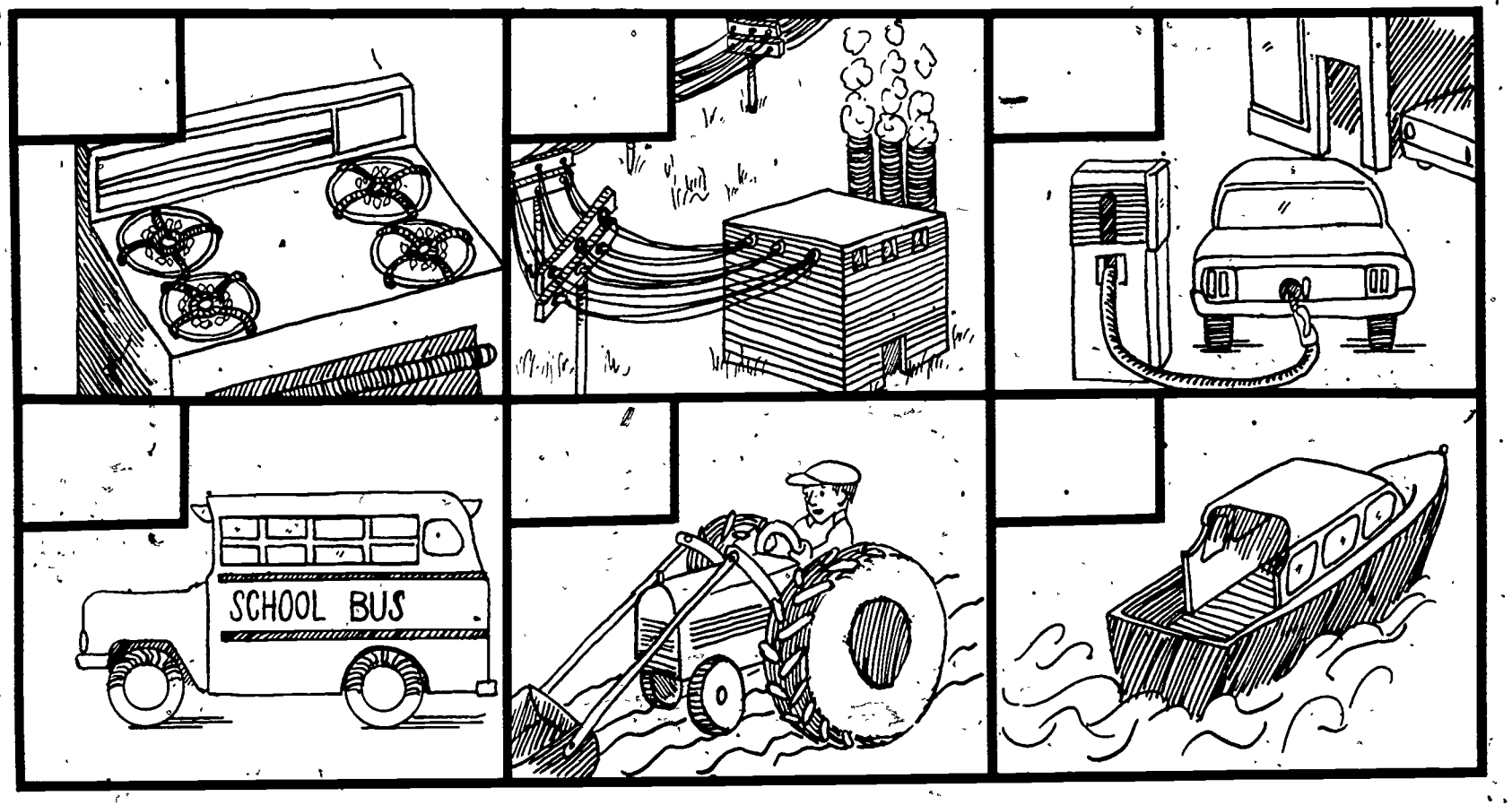
2. Each of the pictures in illustration 5-6 has a block in the corner. Have the children identify the form of energy needed to perform each activity pictured, as they did in number 1 above.

No gas. No oil. No electricity.
Cross out the things Johnny can't do.

5-5

WHAT DO WE USE?

5-6



KEY:

C COAL
O OIL or GASOLINE
G NATURAL GAS
E ELECTRICITY

6. Wind is a Source of Energy

Overview

This lesson develops the children's understanding of wind as one of the sources of energy.

Objectives

Students should be able to:

1. Identify wind as a source of energy.
2. Construct a windmill.
3. Observe the relationship between the force of the wind and the speed of the pinwheel.

Materials

Large paper bag
Cardboard tube
Rubber band
Paper dolls (that will stand up)
Windmill pattern
Paper clips
Milk cartons

Background Information (Teacher use only)

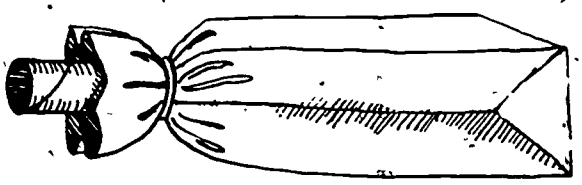
Until the turn of the century, wind was put to good use in this country. It was used mainly for sailing ships and for pumping water and generating electricity on our prairies. However, the wind gave way to the more reliable steam power, and the wind-driven generators gave way to electricity from the big power plants.

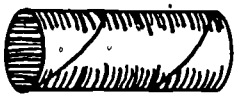
Wind has one major drawback, and that is its variability. If technology can harness wind to an electric system that will not peak and decline, then wind can become a source of power of the future.

Teaching Strategies

This lesson stresses the skill of observation. It also stresses the fact that student opinion must necessarily be tentative and partial. The actual conditions of the wind are learned by further experience.

Announce that today's lesson will be about an energy source that starts with the letter W. Ask students to try to guess what this energy source is while they watch something. You will need the following pictured items:





Paper dolls Paper bag Cardboard tube

Attach the cardboard tube to the open end of the paper bag with rubber bands. Place the bag on the table. Set up the paper dolls at a distance of 4 cm (2 inches) from the end of the tube. Push hard on the bag. Ask: What happened? What was in the bag that made the dolls fall down? *(Air.)* What happened when I pushed hard on the bag? *(It made the air move out fast.)* What do we call moving air? *(Wind.)* Were you ever - like these paper dolls - knocked down by the wind? (Allow the children to share windy day experiences.) What does this show about wind? *(It has energy.)* How do we use the energy in the wind? *(If children mention windmills, ask where they have seen one and what kind of work the windmill was doing - pumping water or grinding corn, etc. If the children mention sailboats, ask if they have sailed in one and if it went fast or slow.)*

Make some windmills. Give each child a dittoed copy of the pinwheel pattern. Cut it out and fasten it together with an unbent paper clip. Cover the milk carton with construction paper. Color doors and windows on this mill-house. Fasten the wheel to the top front of the house by inserting one end of the paper clip into the top of the roof.

Have the child represent the wind and blow the pinwheel. Explain that in a real windmill the turning wheel would turn some machinery to do some work - perhaps draw up water from a well or grind some corn.

Summarizing the Lesson

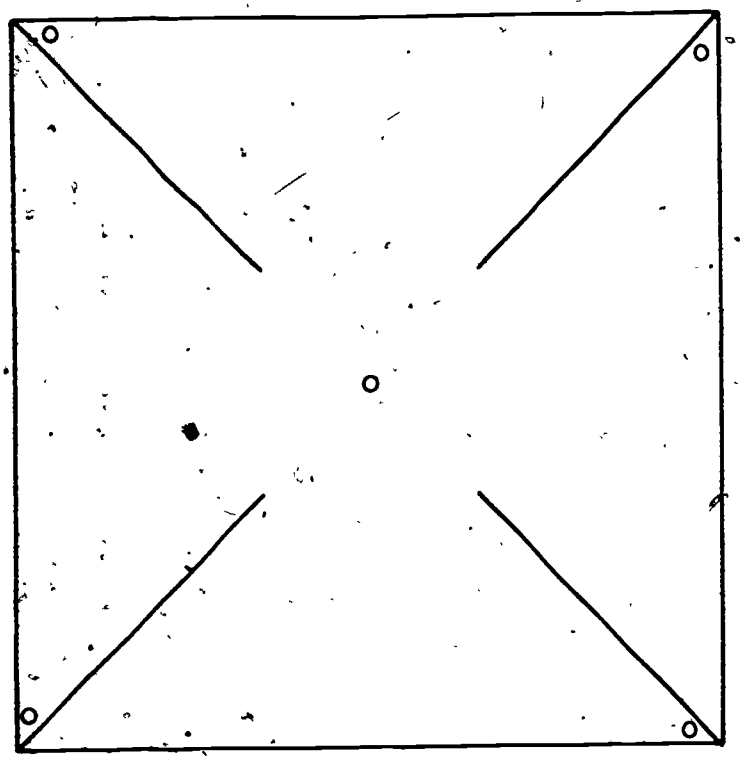
Ask: Does your pinwheel move if you don't blow on it? *(Air currents in the room may cause it to move.)* Blow gently on your pinwheel. Does it move slowly or fast? Blow a little harder. Does your pinwheel move slower or faster? Who can make a rule about the pinwheel? *(The harder you blow on it, the faster it turns.)* What are you using to turn the

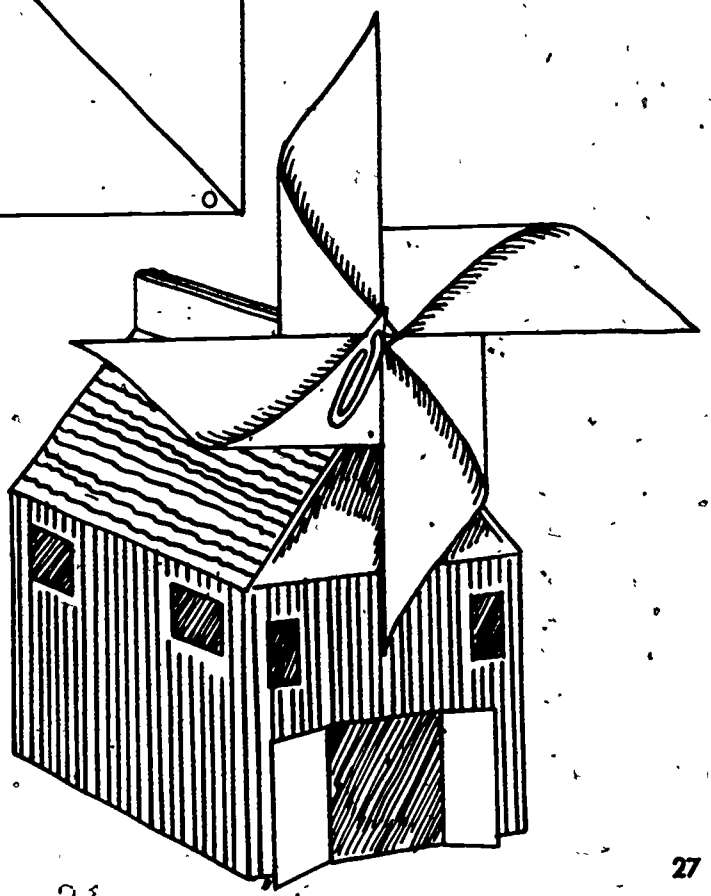
pinwheel? *(Wind energy.)*

Supplementary Activities

Place some drops of poster paint on wet finger paint paper. Blow through a straw to move paint and create a design. Ask students what causes the paint to move?

Make kites to fly on a windy day.





7. Water is a Source of Energy

Overview

This lesson focuses on water as a source of energy.

Objectives

Students should be able to:

1. Identify moving water as a source of energy.
2. Construct a waterwheel and observe that water can make it move.

Materials

Picture of (hydroelectric) dam
Picture of mill with waterwheel
Bottle caps with holes punched in center
Pencils with erasers
Thumbtacks

Background Information (Teacher use only)

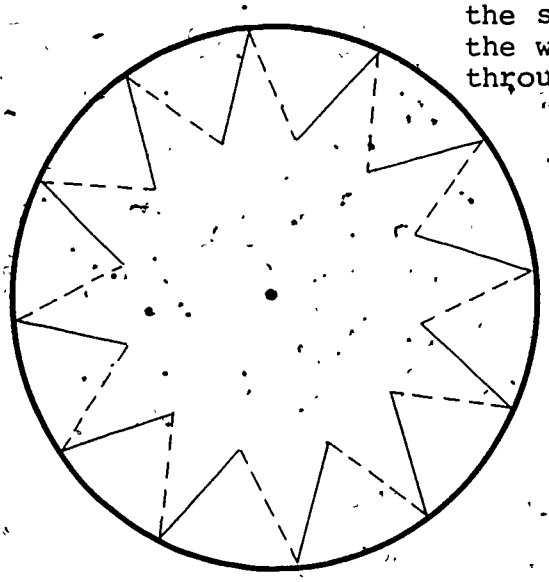
One of the oldest sources of energy used by people has been moving water. People have used water to transport themselves and their goods. They used waterfalls to run the machinery which ground grain and sharpened tools. Today river water collects in natural waterfalls or man-made dams or lakes, where giant waterwheels or turbines run generators which produce electricity.

Using the historical approach, this lesson explains some of the purposes of waterwheels of the past and the growth of hydroelectric plants.

Teaching Strategies

Look at (or have the children bring in) a picture of a mill with a waterwheel. (One good source for pictures is Windmills and Watermills, by John Reynolds (Praeger, New York, 1970.) Ask: What makes this wheel turn? *(Moving water.)* Explain that the farmers used to bring their corn and grain to the miller who would grind them up in his mill. His mill was always built near a river so he could use moving water to turn the grinding wheels. Make a waterwheel and see how it works.

Trace a waterwheel on a piece of tagboard. Cut on solid lines and fold in the dashed lines. Fold in



the same direction around the wheel. Put a pin through the dot. Holding the pin, put the waterwheel under a slow-running faucet and watch the water make the wheel turn. (Dried out after use, this wheel will last through two or three demonstrations. A more permanent wheel can be made using the end of a tin can.)

Look at (or have the children bring in) a picture of a hydroelectric power plant. Show the picture of the hydroelectric plant and dam. Ask:

What is moving in the picture? *(Water and wheel.)*
Where is the water going? *(Over the edge of the embankment.)*
Who has seen a waterfall? *(Ask them to describe how it looked, the noise it made, etc.).*

Explain that a dam is a man-made waterfall - that it is built to use water as a source of energy. Tell them there is usually a large building next to the dam where electricity is produced from the moving water.

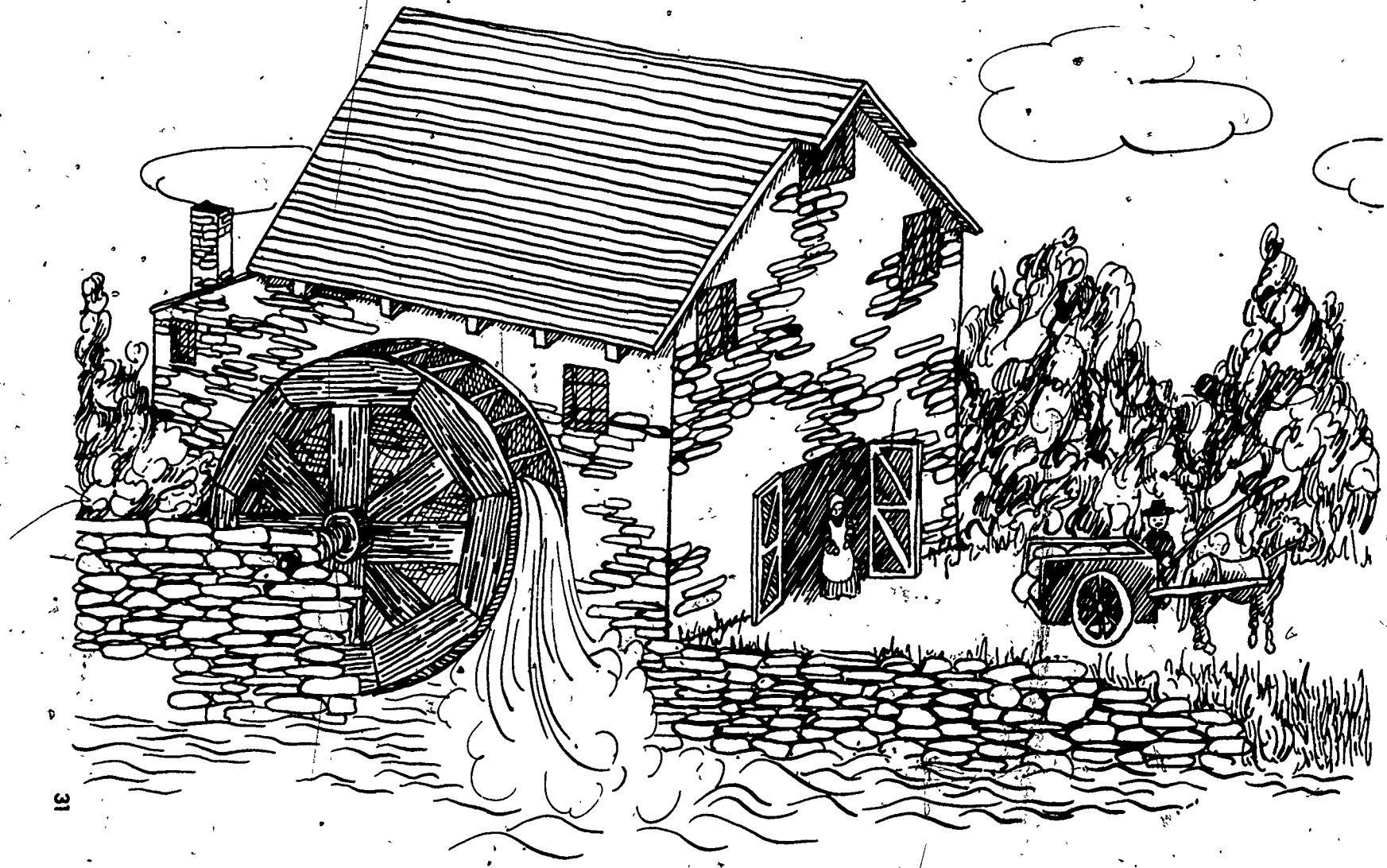
Summarizing the Lesson

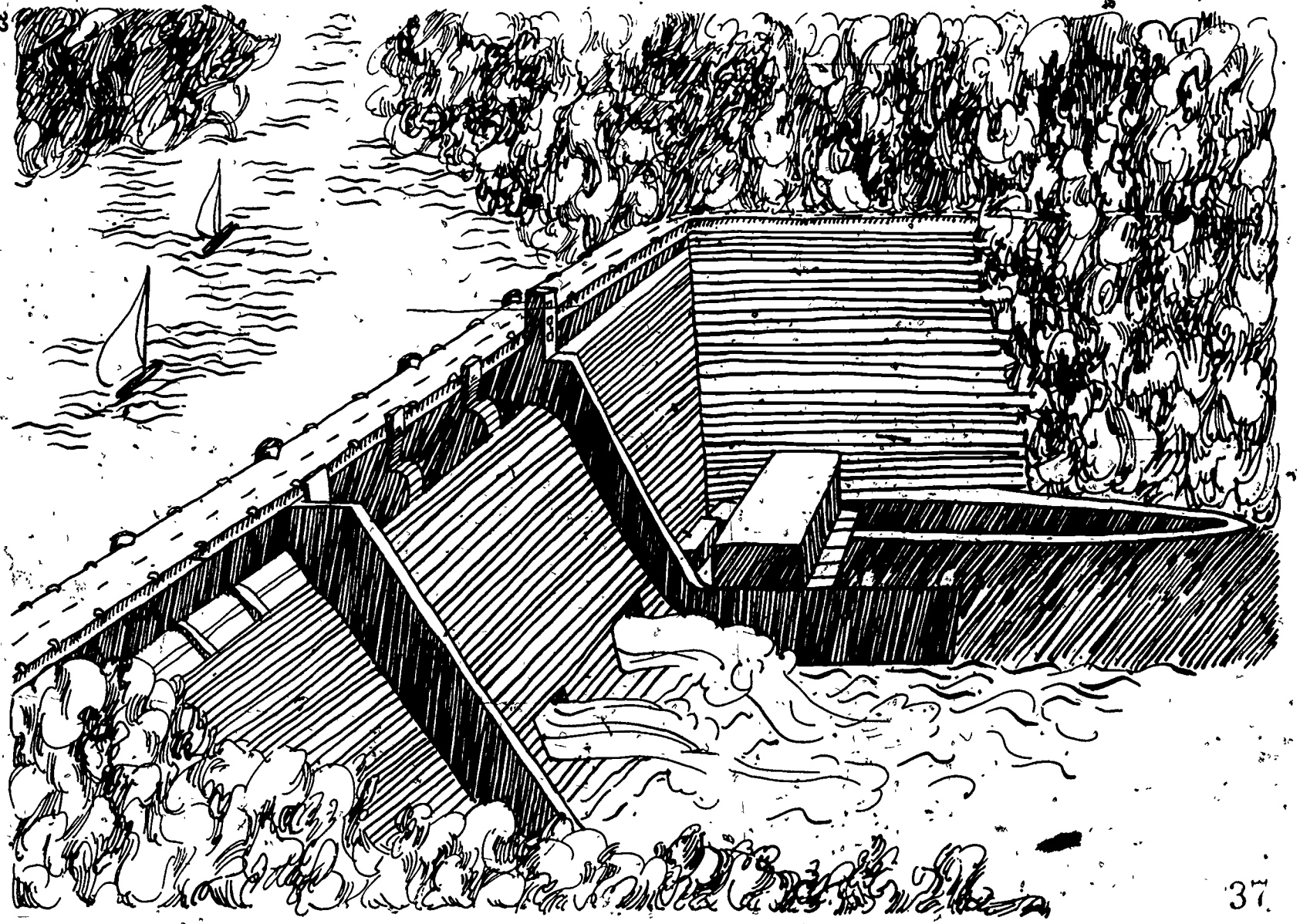
Review the sources of energy with this game:

Ask: What source of energy does a fossil make you think of?
(Coal, oil, natural gas.)
What does a pinwheel make you think of?
(Wind.)
What does a hydroelectric dam make you think of?
(Water.)
What does a growing plant make you think of?
(Sun.)
What does a growing girl or boy make you think of?
(Food.)

Extended Learning Activity

Field Trip - Visit a hydroelectric dam or an old gristmill if one is within your geographic region.





8. Energy Conservation

Overview

This lesson will help to develop an understanding that we use energy in many ways and, because of this use, we must learn to use it more wisely.

Objectives

Students should be able to:

1. Tell how energy is helpful to them in their homes.
2. Suggest ways energy can be used wisely.

Materials

Pencils
Crayons
Manila paper (18" x 24")

Background Information (Teacher use only)

Energy benefits us in many ways. It warms and cools our houses and other buildings, provides transportation, and powers the many engines and processes of industry to improve our lives.

However, the resources needed for production and use of energy are in limited supply. Fossil fuels such as oil and natural gas are in very short supply. Conservation of energy resources is essential. But conservation will require a change in our attitudes and lifestyles. Turning off lights, driving fewer miles, turning down the thermostats, are common ways to save energy. The point of this lesson is that conservation works only when everyone cooperates.

Teaching Strategies

Activity 1: This lesson is best opened with a recollection of the energy tour. Ask: Can someone say how energy helps us here in our classroom? In our school? Can you think of another place where energy is helpful to us? *(Home.)* How is energy helpful in our homes? *(Have children give examples.)*

Develop the lesson by asking if there are other ways energy is used in our homes. Distribute

manila paper to each child. Say: Fold your paper in half lengthwise. (Show them) Fold it in half crosswise. How many rectangles do you have? *(4)* Let's pretend each is a room in your house. (These four rooms should be stated: bedroom, bathroom, kitchen, living room. If you wish to do so, you may add other rooms on the other side of the paper.) As children say the name of each room, print it on the board for them to see. Have the children copy a name on each square.

Ask the students to take this paper home and draw as many energy helpers in each room of their house as they can. Who could help them with ideas? Encourage the students to get their parent's help.

Activity 2: Before the lesson begins, draw four sections on the chalkboard and label them kitchen, bedroom, living roon, and bathroom. Discuss each room in turn asking what energy helpers the children found in it. As each energy user is mentioned, have a child draw it on the board.

Pull the entire lesson together with a statement similar to this one: Look at all the things we found that are energy helpers. These energy helpers are also energy users. Just think how much energy they use when people in every home turn these things on.

Most of the energy we use comes from our fossil fuels that took so long to be made. We want to make sure that they don't run out. How can you help? *(Accept and discuss the suggestions the children give.)*

Summary and Evaluation

Distribute another large sheet of manila paper. Have each child draw one way to save energy. Use their pictures for a bulletin board. Suggestions may be:

<u>After use, turn off</u>:	lights radio TV electric blanket faucets etc.
<u>Turn down</u>:	air conditioner furnace etc.

	Use less energy:	push mower instead of power mower take fewer car trips bicycle instead of car carpool etc.
	Save energy by:	closing doors and windows when air conditioner is running. insulate around windows, doors, and attics for cold weather. closing refrigerator door quickly. etc.

Supplementary Activities

Have a fifth or sixth grader demonstrate a simple circuit using a dry cell and a light bulb. Add extra light bulbs to the circuit. Notice what happens to the amount of light given off by each bulb as another is added. *(Less until they go out.)*

There is a certain amount of energy in the world. When the energy source is used up, there is none left. We need to help save our energy.

Make a home checklist such as the one on page 36. Have your class add other items to the list. Then, take it home for a week to check it.

HOME ENERGY CHECK LIST	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1. Turn off the light.							
2. Turn off the thermostat (with Mother's permission).							
3. Walk to the store.							
4. Turn off the faucet to stop the drip.							
5. Take a short shower instead of a bath.							
6. Pull drapes or curtains to keep the house warm at night.							
7. Close storm door tightly to keep out drafts.							
8.							
9.							
10.							

9. The Best Present of All

Overview

This activity will involve children in a dramatic play which reviews the positive and negative factors involved in the use of various sources of energy.

Objectives

Students should be able to:

1. Make and/or decorate a simple costume or scene to use for the play.
2. Take part in acting out an energy story.
3. Apply what they learned in the story setting to what is the case in real life.

Materials

(These may be as simple or as complicated as you wish.)

Roll of art paper or brown paper bags
Magic marker
Crayons
Collage-type materials stapled or taped together

Teaching Strategies

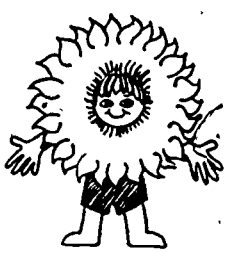
This is a narrative which can be read to your class first as a story to be enjoyed. Then you might want to invite another class in to see it.

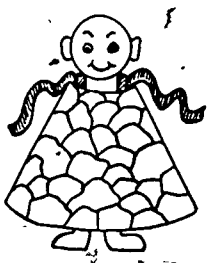
Discuss the various characters and make plans for acting out the story as it is narrated. You will need the following characters (listed according to order of their appearance):

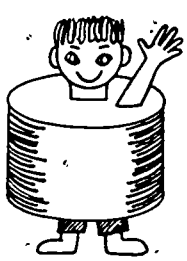
King Oliver	Mr. Atom
Wise Men	General Water
Page Boy	Mr. Geothermal
Mr. Oil	The Golden Sun
Mr. Gas	
Mr. Coal	

You can extend the list by including people of the court. Some children might be used as stage hands to decorate and set up the throne. If you end the story with the King giving lollipops to the court,

you might have a committee in charge of distribution. Try to involve everyone in the class in some way. Some might even be the artists who make posters to advertise the play.







* Adapted for first graders by Wendy and Harold Crater from the story, "The Best Present of All," which appeared in the publication Ranger Rick's Nature Magazine, published by the National Wildlife Federation.

At some time after the play, review what they have learned from the story. Ask the children what materials can be used to produce heat and light energy. Discuss the pros and cons of each form of energy. This should be kept simple but they may pick up more than you expect; some from the play, others from TV or class discussions. These may be among the things mentioned:

Form of energy	Good about it	Not good about it
Oil	Easy to transport	Expensive Scarce May leak and spill Gasoline causes air pollution
Gas	Clean	Expensive Limited supply
Coal	More available	Pollutes the air May spoil the environment (strip mining)
Atoms	Available Clean	Poisonous waste

Form of energy	Good about it	Not good about it
Water	Clean	May spoil rivers and streams Not enough available
Geothermal	Clean No poisonous waste	Available only in limited places
Sun Wind	Unlimited amount available Doesn't spoil the environment	Presently expensive

Note: This is in no way meant to be a complete list, nor would you expect your class to pick up many of these. Any that they get are a plus for energy education.

THE BEST PRESENT OF ALL

Adapted from Ranger Rick's Nature Magazine and condensed by M. Wendy Crater and Harold L. Crater.

This is a story about King Oliver who lived in a cold dark castle. Because he loved the children in his land he invited them to come to a wonderful party with ice cream and cookies and lollipops to eat. King Oliver wanted his party for the children to be extra-special-special. He wanted to give the children "the best present of all" -- a present for all their lives and all their children's lives, too -- a present for forever.

King Oliver asked his wise men to help him. They sat in the cold dark castle and shivered as they tried to think of a special present. A page boy with them wished out loud to be warm and his wish gave the King the idea that he could give his children warmth and light forever.

One of the wise men told the King that a fire would boil water and make steam to warm the castle and turn a motor to make the lights work. The problem would be to find enough fuel. The wise men made a list of things that can be used to produce energy.

The King invited all of the energy sources to the castle.

Mr. Oil and Mr. Gas came in together to talk with the King. Mr. Oil was large and messy and left oily footprints when he walked. Mr. Gas was small and timid. He was very neat and clean looking.

The King asked them how they could make energy for his children's homes.

Mr. Oil told the King that he was really very clean. It was because there were so many cars that there was air pollution. Mr. Gas also said that he would burn clean. Both admitted that they would not last very long because when they are burned they are all gone. The King sent them away because his present had to last forever; and they would not.

Mr. Coal came in next. He was a giant, covered with black stones and leaving dirty dusty puffs of coal when he walked.

He told the King that he could not burn clean. Little pieces would get into the air and in people's clothes and lungs although there was plenty to last a long time. All that had to be done was to push away the grass and trees and dig the coal up.

The King sent Mr. Coal away too. He did not want his children to have dirty air or lose their trees and grass.

The King saw Mr. Atom next. He was a very shiny neat man who bounced when he walked.

Mr. Atom explained how he could split and make energy. He said he got very, very hot and was full of energy. He did have a problem with a poison called radioactivity but could keep the poison in a box. If the King could find a place to put the box for a very long time, the poison would be all gone.

Sadly King Oliver sent away Mr. Atom. The King did not want his children to have to worry about poison.

General Water marched into the room and saluted to everyone. He would flood the valleys and rivers and make a dam, he told the King. That dam would give the King some energy for heat and light. He did not want to lose his valleys and mountains, so the King told General Water goodbye.

The King was feeling very sad. He wanted a good source of energy that would not destroy the land or hurt his children.

The wise men brought Mr. Geothermal to the King. Mr. Geothermal was very round and clean and he puffed and huffed when he walked.

This time the King heard about a good kind of energy that would use the heat already inside the earth to warm homes and turn motors. He could be pumped out of the earth, Mr. Geothermal told everyone in his puffy voice, and the land did not have to be destroyed. King Oliver was happy. He asked Mr. Geothermal to sit beside him. He wanted to

talk with him some more.

Suddenly the room was filled with warmth and light. Before them stood the golden sun. She was like a beautiful golden butterfly. Her dress shone like a thousand golden coins and when she smiled all the room was warm.

The golden sun told the King that her energy made plants and people grow. She said her warmth could be caught in a basket of stones and let out at night to warm a house. She could make the wind blow to make electricity. If the King would build his houses to catch the sun, and make windmills, then his children could have warmth and light forever -- because she would be there forever to serve them. Then the golden sun left the King's castle to visit the other side of the earth.

The King spread his arms wide. He smiled a happy smile. He had a wonderfully good present for his children -- warmth and light from the earth and the sun. And guess what else? Ice cream and cookies and lollipops!

"The Best Present of All," adapted with permission from Ranger Rick's Nature Magazine, National Wildlife Federation, 1412 Sixteenth Street, N.W., Washington, D.C. 20036.

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