Energy

3rd Grade Science Unit

Length of Unit – 7 days

Bronka Lawhorn
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NHMFL

Outline

I. **Energy Sources**
II. **Energy Activities**
III. **Heat/Color Relationships**
IV. **Wasting Energy at Home**

Sunshine State Standards:

SC.A.1.2.2.3.1: The student knows that common materials (e.g., water) can be changed from one state to another by heating and cooling. The student understands that physical changes in the states of matter can be produced by heating and cooling.

SC.B.1.2.2.3.1: The student recognizes various forms of energy (e.g., heat, light, and electricity). The student knows objects that emit heat and light.

SC.B.1.2.2.3.2: The student recognizes various forms of energy (e.g., heat, light, and electricity). The student knows different forms of energy (for example, heat, light, sound).

SC.B.1.2.3.3.1: The student knows that most things that emit light also emit heat. The student knows that the Sun provides energy for the Earth in the form of heat and light.

SC.B.1.2.4.3.1: The student knows the many ways in which energy can be transformed from one type to another. The student knows that heat can be produced by chemical reactions, electrical machines, and friction.

SC.B.1.2.6.3.1: The student knows ways that heat can move from one object to another. The student knows that when a warmer object comes in contact with a cooler one, the warm object loses heat and the cool one gains it until they are both at the same temperature.

SC.B.2.2.2.3.1: The student recognizes the costs and risks to society and the environment posed by the use of nonrenewable energy. The student knows ways natural resources are important.

Day 1 - Energy Sources

Objectives: The third grade students will observe different types of energy sources. They will learn more about energy and where it comes from.

Background information: Sources of energy are all around us, and come in a variety of different forms. Energy for a person is different than energy for an automobile.

Materials:

- Picture of the sun
- Fruit or vegetable
- Piece of firewood
- Piece of charcoal or coal
- Container of motor oil
- Gas lighter
- Cup of water and an empty cup
- Child's pinwheel
- Picture of lightning or a light bulb
- Picture of a nuclear power plant
- Piece of discarded trash
- Battery
- Worksheet #1 – "Energy Sources" (Assessment - one for each student)

Procedures:

1. Display all of the items on a table and ask the students which they think are a source of energy.
2. Each item should be labeled (an index card with title on one side and detailed description on the other side) with a card in front of it. (Number the cards with corresponding numbers on items).
3. After students take turns guessing, go over every item individually and give full description to class.

Extensions/Modifications

1. Assign the energy words as a homework vocabulary assignment to your students. Have students complete sentences using the words.
2. To extend this activity, have each student write a one-page essay on which three energy sources they would choose as the "best" sources of energy for the world. Tell them to explain why they chose what they did. This can be given as an in-class assignment or as a homework assignment. When the essays have been completed, ask some students to read theirs aloud. Display the completed essays in the classroom.

Summary:

Remind the students that sources of energy are all around us and come in a variety of different forms. Review the day's lesson and ask for questions. Tell the students that tomorrow they will participate in activities to learn how energy works in our world. Assign worksheet #1- Energy Sources.

Assessment:

Pass out the Worksheet #1 – Energy Sources to each student. Read the questions out loud but have them work individually. Call upon students to provide answers and allow students to correct papers. Collect for daily Science grade.

Name:_____**Date:**_____

Energy Sources

wind	**natural gas**	**chemical**	**sun**	**nuclear**
water	**refuse-derived fuel**	**food**	**electrical**	**coal**

1. The light that comes to earth from the _____ is pure energy.
2. One of the three fossil fuels, _____ is burned to heat homes and run electrical machinery.
3. _____ that blows can be used to turn windmills, which generate electricity.
4. _____ is the source of energy used by people. The stored energy is used by the body to keep the heart beating, the blood pumping and the body growing.
5. _____ falling downhill is used to run turbines, which generate electricity. This is called hydroelectric power.
6. A storm contains a great deal of natural _____ energy.
7. Batteries create energy through _____ reactions.
8. _____ power produces far more power per ton than any other energy source. It does not contribute to air pollution. The drawback to this power is finding a safe place to dispose of the waste.
9. _____ is discarded trash that is burned in a waste-to-energy facility. As it burns, water pipes are heated and this hot water is used to generate electricity.
10. _____ is a fossil fuel used to heat many homes and is also found in lighters.

Energy Sources - fossil fuels

sunlight food wood coal

oil natural gas water wind

electricity nuclear power

chemical energy refuse-derived fuel

Sunlight – The light that comes to the earth from the sun is pure energy. The sun is the original energy source. Nearly all other sources of energy originally got their energy from the sun. Organic matter, like plants, convert solar energy into leaves, flowers and fruits. Animals, which eat organic matter, convert the energy into body mass. When animals die, their energy is decomposed and over extensive time, becomes stored as oil, coal or natural gas.

Food – Food is the source of energy used by people. Food that we eat is digested, and the stored energy is used by the body to keep the heart beating, the blood pumping and the body growing. When a body has “low blood sugar”, the body needs to eat and process more energy, so we can continue working, playing and growing.

Wood – Wood comes from trees, which are, of course, plants. The plants got their energy from the sun. When trees are cut down and burned, they release their energy in the form of heat. Many homes are heated with wood-burning stoves or fireplaces.

Fossil Fuels – Coal, oil and natural gas are the three energy sources that come from prehistoric fossils. Like the methods described in wood, ancient plants absorbed the energy from the sun and converted it into more plants. Ancient animals, like dinosaurs, ate the plants. When the plants and animals died, their remains collected under mountains of earth and, over millions of years, they decomposed into a source of fuel. The remains of these plants and animals are what we refer to as fossil fuels.

Coal – Coal is burned to heat homes and run electrical machinery. About 20% of the energy we use comes from coal.

Oil – Hold up a container of motor oil. Other petroleum products similar to motor oil are burned to fuel motor vehicles and heat homes. About 45% of energy comes from oil.

Natural Gas – Natural gas is used to heat the homes of many people. About 25% of the energy we use comes from natural gas. The fuel used in lighters is not the same as the natural gas used to heat homes, but the lighter can be used as an example.

Water – Water is not an energy source, but water is used to generate energy. Water falling downhill is used to run turbines, which generate electricity. This is called hydroelectric power. About 5% of the world's power is now produced by hydroelectric dams.

A similar type of energy comes from geothermal energy. Pockets of boiling water under the earth's surface send steam to the surface of the earth. This hot water also can be used to generate electricity. Dams can impede the movement of fish up and down river to reach spawning grounds or for other migratory purposes.

Wind – Winds that blow can be used to turn windmills, which generate electricity. Windmills have been used for centuries in some parts of the world, like Holland. Windmills are also used in the United States.

Electricity – An electrical storm contains a great deal of natural electrical energy. Benjamin Franklin first proved that lightning was electricity in 1752. His discovery helped scientists learn how to harness electricity and how to generate electricity from other methods. The electricity we use today was created by other sources, not by the energy released by lightning.

Nuclear Power – Nuclear power comes from the radioactive ore uranium. It produces far more power per ton than any other energy source. Nuclear power does not contribute to air pollution. However, radioactive waste is hazardous to living things. Exposure to radioactive materials can result in mutations, illness or death. The drawback to using nuclear power is finding a safe place to dispose of the nuclear waste. About 6% of the energy used in the world comes from nuclear power.

Refuse-derived Fuel – Now, we are able to extract energy from garbage! Garbage is burned in a waste-to-energy facility. As it burns, water pipes are heated. This hot water is used to generate electricity. Most waste-to-energy facilities produce enough energy to run the plant and supply additional power to the community. This is a small but growing source of energy.

Chemical Energy – Batteries create energy through chemical reactions. When different chemicals react with one another, energy is released. Eventually the reaction stops, and the battery must be replaced. Batteries are used in motor vehicles and many smaller appliances, like clocks, hearing aids and toys.

Day 2 – Energy Activities

Objectives: The third grade students will conduct experiments to learn about how energy works in our world. They will work in groups to explain the phenomenon they observe.

Background information: Everything that occurs in the world comes about as an exchange of energy. But energy cannot be seen, heard, felt or touched. It is invisible, yet it's the force that makes life possible.

Materials:

- Watch or clock with second hand
- 5 thermometers
- 10 tart pans, 3 inches in diameter (one pan painted black)
- Solar calculator
- Water
- Desk lamp
- Newspaper
- 2 cups of ice

For individual windmills (enough for each student to make one)

- Paper cut into 3-inch by 6-inch strips
- Paper cut into 3-inch by 2-inch squares (4 per experiment)
- Tape
- Unused pencils
- Paper clips
- String
- Handout (one for each student)

Procedures:

1. This activity is best conducted outdoors in an area protected from the wind.
2. After a discussion of energy and a reminder of the sources of energy from the previous day, direct students in these energy experiments.
3. Divide the class into 2 groups. Hand out the Energy Experiments worksheet to each student.
4. Have all of the materials set up at individual centers.
5. Each group will perform all 5 experiments with students taking turns having 2-3 conduct each experiment.
6. Since 3 of the 5 experiments require a temperature reading after 10 minutes, allow students to do more than one of these at a time.
7. Have students plan their time so that they can complete the experiments in the time allotted for the activity.
8. Be available to assist your students in their experiments or in their explanations of what happened. Guide them through difficult explanations.
9. When all of the experiments are completed, take a few minutes and have the students explain the experiments. Be sure the students clean up the remains of the experiments.

Extensions/Modifications:

1. To simplify this activity, you may choose to conduct the experiments as part of a demonstration and discussion activity.
2. To expand this activity or make it more difficult, look up more energy experiments in books and curricula.

Summary:

When everyone is back in their seats, use this time to test for knowledge. Randomly ask students about each of the different experiments. If they communicated well with each other, each student should know the answer, or be able to guess at the answer. If necessary, explain the concepts again at this time.

Assessment:

No formal assessment necessary. Collect each student's handout for a completion grade.

Name: _____ Date: _____

Energy Experiments

Solar:

1. Solar energy creates electricity using solar cells. A solar calculator provides an example of this. Using the calculator, make a simple calculation (addition, subtraction, multiplication etc.). Then find the solar cells and cover them with your finger for 30 seconds. Keep your finger on the solar cells and try to make the calculation again. What happens?

2. Set out an unpainted aluminum pie tin and a second tin painted with black paint. Fill both pans with exactly the same amount of water. After ten (10) minutes, check the temperature of both pans. What are the differences?

   Why did this occur?

3. Set out a spoon and a cup of tap water in the shade. Place the spoon in the sun for 5 minutes. Place the thermometer in the tap water and read the measurement. (*Leave thermometer in the water.) Place the hot spoon in the water. Record results immediately and continue recording every minute for 5 minutes. What Happened?

   Why?

Cooling:

1. Place one aluminum pan with water in the sun. Place another under a shady tree. After ten (10) minutes, check the temperatures of the water in the pans. Which is warmer?

   Why?

Heat:

1. Place a desk lamp over an aluminum pan with water in it. Set a second one, with the same amount of water, away from the lamp. After ten (10) minutes, check the temperature of each. Which is warmer?

   Why?

Insulation:

1. Place a cup filled with ice in the sun. Wrap newspaper around a second cup of ice, and place it in the sun. The ice in which cup melts faster?

   Why?

Wind: Do in classroom together with teacher.

1. Wrap a large piece of paper around the pencil. Tape it – Make sure it fits loosely! Tape the four (4) squares to the paper. Tie the paper clip to the string and tape the other end of the string to the paper tube. Blow on the blades of paper. You have created a windmill!! The wind from your blowing on it should cause the tube to turn, and it should wind the string with the paper clip up the tube. Why does the windmill turn?

Day 3 – Heat/Color Relationships

Objectives: The third grade students will use the scientific method to discover which colors absorb heat and which colors best reflect heat. Students will demonstrate how this information can be used at home and in the community.

Background information: Review with students the results from the previous days experiments with the pie tin and painted black pie tin. Go over some of the answers given for that experiments question.

Materials:

- Assorted color construction paper envelopes. Ensure you have a black one and a white one.
- 4 Stiff tag boards or poster boards
- Cardboard or poster board for envelopes
- Thermometers
- Paper, pencils, crayons
- Journals
- Tape

Procedures:

1. Ask students if what they wear makes a difference on how hot or cold they are. Write their answers on the whiteboard. Discuss.
2. Have students tell you some of their favorite colors. List them on the white board and make sure that you have black and white on your list.
3. Have students guess what color is hotter and what color is cooler. Use tally marks on the tag board to show the number of student's guesses.
4. As a mathematics extension:
    A. Have students figure the mean, median and mode.
5. Have students write a hypothesis in a science journal or on a piece of paper.
6. Have students make envelopes out of construction paper corresponding to their favorite colors in #2.

Day 4 - 7 – Heat/Color Continued

(This will take approx. 10-15 minutes daily and should be done in conjunction with scheduled science lesson for the day)

Procedures:

1. Using envelopes that you made out of construction paper that corresponds to the colors that the students chose, place a thermometer inside each envelope.
2. Display a chart, prepared ahead of time, on poster board that looks like this:

Color Chart – How hot is my color?							
Day of The Week	Color	Time Put in The sun	Time taken out of the sun	How long left in the sun	Temp. Before put out in the sun	Temp. After one hour	Difference in temperature
Monday	Blue						
Monday	White						
Monday	Green						
Monday	Black						
Monday	Yellow						
Monday	Purple						
Monday	Orange						

3. Make one for each of the four days that you will gather data.
4. Get your beginning measurement and put it on the chart.
5. Tape the envelopes on to a piece of cardboard and place the cardboard out in the sun.
6. After one hour take the students outside and record your data.
7. Have students do the math and record the data in their journals and on the chart.
8. Discuss with the students the findings; see if any want to revise their hypothesis. Have them record their thoughts and findings in their journal or log.

Extensions/Modifications:

1. Have the students do an audit of the school and of their homes.
2. Have the students present their findings to the school administration.
3. Have the students talk to their parents about what they have discovered.

Summary:

After all of the data collection is complete, have the students graph their findings. Talk about how houses are like people. If a house is painted a dark color or has a dark roof it is just like you wearing a dark shirt on a hot summer day. It is cooler if your house, like yourself, wears a light color.

Assessment: None necessary for this activity.

Day 4 – Are you wasting energy at home?

Objectives: The third grade students will identify ways energy is wasted. The students will list ways to conserve energy in the home. The third grade student will be able to define conservation.

Background information: We use more energy each year than we used the previous year. In fact, during the 20th century, the amount of energy our Nation uses has doubled about every 20 years. We used twice as much energy in 1955 as in 1935 and nearly twice as much in 1980 as in 1960. The rates of increase in our energy consumption have slowed somewhat, but we continue to use more and more energy.

Energy conservation is the wise and efficient use of energy. We need to think about and practice energy conservation every day. Not only does energy conservation save us money on our energy bills now; it saves us (and consumers in the future) money in the long run by making our irreplaceable energy resources last longer.

Materials:

- Crayons or colored markers
- Wasting Energy Transparency
- Wasting Energy Student Handouts
- How to Conserve Energy Transparency
- How to Conserve Energy … Student Handouts
- Home Energy Survey Transparency
- Home Energy Survey Handouts
- Appliance Energy Use Transparency
- Energy Users Transparency
- Conservation Handout (Formal Assessment)

Procedures:

1. Define energy conservation and share the background information as appropriate.

2. Give each student a copy of the student sheet “WASTING ENERGY,” included.
3. Have the students draw an “x” on the ways energy is being wasted.
4. Ask the students, “How can energy be conserved in this picture?” (turn off lights, turn off TV, close door; some students may suggest covering the window and/or carpeting the floor).
5. Have the students list examples of how energy is conserved in their homes.
6. Collect handout and record participation grade (make sure students completed handout).
7. Give each student a copy of the student sheet “HOW TO CONSERVE ENERGY IN YOUR HOME,” included. Discuss the directions with the students. Have the students take the sheet home and complete it with the help of their parents and return it to school.
8. Have the students identify energy users and wasters in their homes.
9. Give each student a copy of the student sheet “HOME ENERGY SURVEY,” included.
10. Make a transparency of the teacher information sheet “APPLIANCE ENERGY USE,” included.
11. Have the students find and list the home appliances pictured and listed on the transparency.
12. Put the following headings on the board and divide the listed appliances into these categories – “Heavy Users of Energy,” “Moderate Users of Energy,” and “Light Users of Energy.”
13. Discuss with the students which appliances shown on the “HOME ENERGY SURVEY” sheet they have in their own homes.
14. Have the students circle in red the depicted energy wasters found in their own homes.

Extensions/Modifications:

1. Invite a speaker from your local power company to speak to the class about ways to conserve energy.

2. Have the students, with the help of their parents, compare several months utility bills and discuss ways to conserve electricity.
3. Have the students project what will happen to electrical costs by the year 2020, then write and perform a skit showing a family receiving and paying an electric bill in that year.

Summary:
Ask the students to tell you, in their own words, the definition of conservation. Use the “Energy Users” Transparency. Cover up the right side “Ways to Reduce Energy Use” and have the students offer suggestions before uncovering answers.
Don’t forget: Today’s students are tomorrow’s consumers. Remind the students that developing energy conservation skills will serve them well in the future, when prices are certain to be higher than they are now. Additionally, students may be able to help their families conserve energy at home, benefiting themselves and others both now and in the future.

Assessment: Collect the handouts. At conclusion of lesson give the students the “Conservation Handout”. They will complete this on their own as a formal assessment.

Energy Users	Ways to Reduce Energy Use
1. Television, lights radio, phonograph	1. Turn off when you are not using.
2. Range (stove)	2. Cover pots; thaw frozen foods before cooking; plan meals carefully.
3. Washer	3. Wash full loads; use cold water.
4. Driving	4. Walk; ride in carpools; ride a bike; observe speed limits; keep car in good running condition.
5. Bath	5. Short shower instead of deep bath; take shorter shower or shallower bath (use less hot water).
6. Outside doors	6. Install storm doors; keep doors closed when using heat or air conditioning; install weatherstripping.
7. Thermostat	7. Set at 68 degrees in winter and turn down at night; wear warm clothes; set at 78 degrees in summer; wear cool clothes.

8. Fireplace	8. Close flue when not in use; install glass fire screen that can be closed when fireplace is not in use.
9. Windows	9. Close draperies at night; put shutters, blinds, or drapes on all windows; install storm windows; install weatherstripping.
10. Appliances	10. Do not use several heavy users at the same time; turn off appliances when not in use.

Name: _____ Date: _____

Conservation of Energy

1. In your own words, write the definition of energy conservation.

2. List 5 ways to conserve energy in the home.

3. List 1 way that we could conserve energy in our school.