

What is Energy?

LEVEL: Grades K-3

SUBJECTS: Science, Mathematics, Language Arts

SKILLS: Analyzing, applying, comparing similarities and differences, observing, understanding cause and effect, concluding

NOTE

This is a curriculum designed for use with an interactive whiteboard. Many aspects of the curriculum can be used without an interactive whiteboard, it is not mandatory that a classroom have that technology in order to properly use this curriculum.

MATERIALS

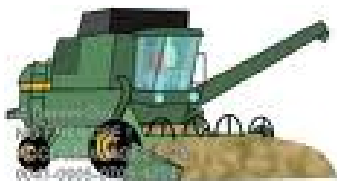
Several boxes or cans in which food labels are apparent (specifically the number of calories). A radio or instrument to make sound. A plant to demonstrate growth. A toy tractor, truck, combine, etc.

CONCEPTS

Energy makes change. Energy is the ability to do work (change). Energy comes in various forms such as light, heat (thermal), motion (mechanical), sound, and growth (chemical). All energy falls under two categories: kinetic and potential. Electricity is a secondary energy source. There are two sources of energy: Renewable and Nonrenewable.

SUPPORTING INFORMATION

Energy produces a change of some kind; it does things for us. We use energy to move cars along the road and boats across the water. Energy is used to bake a cake in the oven and keep your popsicles frozen. It provides power so you can watch your favorite TV show or hear your favorite song on the radio. Energy lights our homes. It makes our bodies grow and allows our minds to think. Energy is the ability to do work.



BRIEF DESCRIPTION

Students will learn that energy makes change. They will understand that energy comes in varied forms such as light, heat (thermal), motion (mechanical), sound, and growth (chemical).

OBJECTIVES

The students will:

- Brainstorm and make a list of all the things that energy does;
- View samples of the varied forms of energy;
- Discuss where objects get their energy;
- Discuss what life would be like without certain forms of energy;
- Evaluate food packages and be able to explain how calories provide energy to living things;
- Understand that electricity is a secondary energy source;
- Know the difference between kinetic and potential energy;
- Be able to demonstrate kinetic and potential energy;
- Understand the difference between renewable and nonrenewable energy.

ESTIMATED TEACHING

TIME

Session 1: 30-60 minutes

Session 2: 30-45 minutes

Session 1

PROCEDURE

Notebook
Page 2

Open the Notebook file to begin discussion on **What is Energy?** Ask the students to discuss and make a list of the things that energy does. Write their ideas on the interactive whiteboard. Use this brainstorming time to be sure that the various forms of energy are discussed briefly (light, heat (thermal), motion (mechanical), sound, and growth (chemical)). They will be discussed in greater detail as the lesson proceeds.

Notebook
Page 3

Use **Notebook page 3** to enhance your brainstorming session. Ask students the following questions:

- Where does the hair dryer get its energy? (electricity)
- What kinds of energy does the hair dryer make? (heat, motion, sound)
- Where does the boy get his energy? (food)
- Where does the food get its energy? (Sun or light)
- How does the boy use his energy? (move/ motion, see, hear, think, stay warm or cool)
- Where does the computer get its energy (electricity)
- What kinds of energy does it make? (sound, light, heat)
- Where does the car get its energy? (gasoline, battery, electricity)
- What kinds of energy does it make? (sound, motion, heat)
- Where does the corn get its energy? (Sun or light)
- What kind of energy does corn make? (food for people & animals, gasoline)

Notebook
Page 4

Page 4 of the Notebook file is a KWL chart. Have the students give you some ideas on what they **Know** about energy. Then have the students give you some ideas on what they **Want** to know or **Wonder** about energy. The last column will be what they **Learned** about energy. Complete the last column at the end of the energy lesson.

Beginning with page 5 in your Notebook file we will begin to look at each form of energy separately. Light is energy because light is change. Discuss how life would be different if we didn't have light. We use light for more than just seeing things. The energy in light helps plants grow. Light can even give us electricity through solar power. Use the following questions to stimulate discussion:

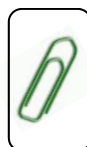
- How do the things in the pictures make light?
 - How is light important to us?
 - What other things make light?
 - How is the light from the moon produced? (Sunlight is reflected from the surface of the moon).
 - What is life like at home at night when the power goes off and you have no light?
- Have the students close their eyes and imagine a world without light.

Use the BrainPop website which is a link on Notebook Page 5 or in the attachment tab in the Notebook file. Click on BrainPop Energy Light. Through BrainPop you can have the students listen to a story, draw a picture using light energy, take the quiz, etc. This is one opportunity to bring them to the whiteboard and make the lesson interactive and fun. (*Note: Most links are to BrainPop Jr. but you might find BrainPop ages 3rd grade and up more challenging and informational).

Page 6 begins discussion on heat (thermal) energy. We can't see heat, but we feel it and we use it everyday. Discuss what makes heat (our bodies, a stove, a light, etc.). Discuss how sometimes we have too much heat and we do things to take it away like put food in a refrigerator, turn on the air conditioner, or jump into a pool. Use the following questions to stimulate discussion:

- How do the things in the pictures make heat?

Notebook
Page 5



Notebook
Page 6

Notebook
Page 6
cont'd

- How is heat important to us?
- What other things make heat?
- How do jackets help keep us warm? (They hold in the heat from our bodies)
- How do you keep your house warm in the winter?

Have the students rub their hands together to feel the heat produced by friction. Look in the attachments tab for an additional activity on heat.



Use the BrainPop website which has a link on Notebook Page 6 or is located in the attachment tab in the Notebook file. Click on BrainPop Energy Heat. Through BrainPop you can have the students listen to a story, draw a picture, take a quiz, etc.

Notebook
Page 7

Page 7 of the Notebook file discusses motion (mechanical) energy. Many things move and that motion takes energy. Nothing can move without energy. Cars get their energy from gasoline. The clouds move because of energy in the wind. Plants get their energy from the sun, etc. Use the following questions to stimulate discussion:

- Where do the things in the pictures get the energy to move?
- What gives you the energy to move? (energy from the food we eat)
- What makes a ball roll down hill? (gravitational energy)

Have the students hold very still and try very hard not to move. Then have them think about all the things that are still moving in their body.

Notebook
Page 8

Page 8 of the Notebook file discusses sound as energy. Introduce sound as energy by playing music (via the radio, computer, an instrument, etc.) As the students hear the sound from the radio made it to their ears so they could hear it. Energy is moving around you at all times—energy in the form of sound waves. Sound waves are everywhere you just can't see them.

Even on the quietest night you can hear sounds.

This may be an excellent opportunity to reinforce the five senses! Have the students hold very still once again. Have them listen intently and see how many different sounds they can hear ... all travelling through sound waves!

Sound is a special kind of kinetic (or motion) energy. Tell the students they will learn more about kinetic energy in the next lesson. All sounds are caused by vibrations. The back and forth motion of molecules causes them to collide and pass on energy as a moving wave! Use the following questions to stimulate discussion:

- How do the things in the picture make sound?
- How is sound important to us? (communication, music/entertainment)
- What makes some sound pleasant and some unpleasant? (pitch, volume—demonstrate by turning up the volume on the radio or running your fingernails down the chalkboard)
- How does your throat make sound? (The muscles in your chest push air past your vocal chords, making them vibrate)

Have the students feel their throats while humming a tune.

Fill jars with different levels of water. Have the students tap the jars with a pencil to hear the different levels of pitch. Make the sample kazoo located in the attachments tab and discuss the sound energy. Click on the link at the bottom of the page to hear how sound effects are made.



Page 9 of the Notebook file discusses growth (chemical) energy. Use a prop such as a plant and ask the students if they know how that plant grows. Explain to them that

Notebook
Page 9

Notebook
Page 9
cont'd

growth is change and energy (from the sun) makes things grow. This energy is called **chemical** energy which is stored in simple sugars. Explain to the students that the energy that makes these sugars comes from light which has already been discussed. Almost all light energy comes from the sun. Use the following questions to stimulate discussion:

- How do the things in each picture get its energy to grow?
- Can you get energy straight from the sun to grow?
- What happens if you eat more food than you need? Not enough food?



Activity: Look at food packages. If you do not have packages of food than you can use the food labels located in the attachments tab of the Notebook file. Explain to the students that calories are a measure of energy in the food. See if the students can locate the calories in the food. An “energy picnic” may be appropriate at this time. Serve fruits and vegetables that get energy directly from the sun. Ask the students to draw a picture and/or diagram to illustrate where their energy comes from and where it goes.

Notebook
Page 10

Electricity is a secondary energy source. This means that through the varied forms of energy already discussed, electricity is generated. Have the students touch each picture on page 10 to determine how electricity is produced.

Electrical Energy comes from:

- Sun (Solar)
- Water (Hydro)
- Wind
- Coal
- Internal heat of earth (geothermal-geysers)
- Natural Gas

Notebook
Page 11

Energy makes things possible. We have learned that energy can be changed from one form to

another (sun to electricity). Because changes in energy occur we live more comfortably.

Take a moment to review what has been learned. Go back to Page 4 of the Notebook file to complete the KWL. Fill in the Learned column.

REVIEW

Session 2

Notebook
Page 12

As we have learned energy comes in many forms (light, heat (thermal), motion (mechanical), sound, and growth). These forms of energy fall into two categories called **kinetic** and **potential**. Use Page 12 of the Notebook file to begin discussion on the difference between kinetic and potential energy. Moving energy is called kinetic energy. Stored energy is called potential energy. View the video on page 12 to gain a better understanding of the difference between kinetic and potential energy.

Take some time to demonstrate with the students the difference between kinetic and potential energy. Use a toy tractor or truck and have the students demonstrate when that toy is using kinetic energy and when it is using potential energy. This could make a nice group activity. Discuss that when the toy tractor/truck was moving it was using kinetic energy. While the toy tractor/truck was sitting still it was using potential energy.



Use **Page 13** in the Notebook file to have the students come to the interactive whiteboard to fill in the appropriate answers for the blanks. Have the students use their finger or pointer to move the words kinetic or potential to the correct blanks on the page.

Notebook
Page 13

Renewable energy sources can be used again quickly. Renewable energy sources include biomass, geothermal energy, hydropower, solar energy, and wind energy. They are called renewable energy sources because

Notebook
Page 14

they can be replenished in a short time. We use renewable energy sources mainly to make electricity.

Most of our energy comes from nonrenewable energy sources. Coal, petroleum, natural gas, propane, and uranium are nonrenewable energy sources. These nonrenewable energy sources are used to make electricity, to heat our homes, to move our cars, and to manufacture all kinds of products. Petroleum, for example, is used to make our cars go. Petroleum was formed many years ago from the remains of ancient sea plants and animals. We can't make more petroleum in a short time.

Notebook
Page 15

It is important that students understand the difference between renewable and nonrenewable energy AND understand that currently the U.S. uses mostly nonrenewable energy sources. The graph illustrates that 93% of the energy we use in the U.S. is from nonrenewable energy sources (37% petroleum, 24% natural gas, 23% coal, and 9% nuclear electric power).

Notebook
Page 16

- 4.1b Energy can be transferred from one place to another.
- 4.2a Everyday events involve one form of energy being changed to another. Animals convert food to heat and motion. The Sun's energy warms the air and water.
- 4.2b Humans utilize interactions between matter and energy. Chemical to electrical, light, and heat: battery and bulb. Electrical to sound (e.g., doorbell buzzer). Mechanical to sound (e.g., musical instruments, clapping). Light to electrical (e.g., solar-powered calculator)

ADDITIONAL RESOURCES AND CREDITS

KidWind Wind Energy Science Education. <http://www.kidwind.org/>

Energy Kids: U.S. Energy Information Administration. <http://www.eia.doe.gov/kids/>

National Energy Education Project. <http://www.need.org/>

Energy Star Kids. http://www.energystar.gov/index.cfm?c=kids.kids_index

NYS Learning Standards

- 4.1a Energy exists in various forms: heat, electric, sound, chemical, mechanical, light.

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