SECOND GRADE
FEBRUARY

SOURCES OF ENERGY

Students will identify sources of energy and how the energy is used.

THERE ARE ONLY TWO BIG STATIONS

GENERAL INTRODUCTION:

Today we are going to learn about energy sources.

- I want everyone to rub their hand together slowly, now faster. What happens when you rub your hands together faster? (They get hotter, right?).
- People used to light fires by rubbing sticks together unto they were hot enough to make a spark. It took very long time!
- We just made a type of energy we are going to learn about today.
- What type of energy do you think that is?
- That's right, Heat energy!
- How do we know energy exist? We will find out today!
- Have you ever heard your Mom or Dad or someone else say, I have no energy?
- What does that mean?
- You are tired sick or just plain lazy, right?
- It means to get moving, we must have IT.
- Energy is what makes things work.
- It is mysterious. You cannot see it, but you can see what it does to things around you.
- Energy makes change; it does things for us. It moves cars along the road and boats over the water. It bakes a cake in the oven and keeps ice frozen in the freezer. It plays our favorite songs on the radio and lights our homes. Energy makes our bodies grow and allows our minds to think. Scientists define energy as the ability to do work. People have learned how to change energy from one form to another so that we can do work more easily and live more comfortably
- We are going to look for change in our activities today.

Divide the kids in two big groups if possible. Otherwise do one activity after the other.

STATION 1: POTENTIAL ENERGY AND ENERGY OF MOTION

MATERIALS:

Activity 1: The Potato Clock

Materials

- two Potato clocks
- potatoes and other vegetables (not in the box)
- the world's simplest motor

Activity 2:The hand held DC generator

Materials

- The hand held DC generator

Activity 3: The world's simplest Motor

Materials

- the plastic frame
- the battery
- the coil of wire
- and the magnet

Activity 4: Using both machines

Materials

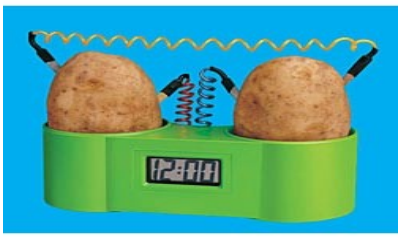
- The Hand- held DC Generator
- The wires that come with the H-and held DC Generator
- The World's Simplest Motor

STATION 1
POTENTIAL ENERGY and ENERGY OF MOTION

Activity 1: The Potato Clock

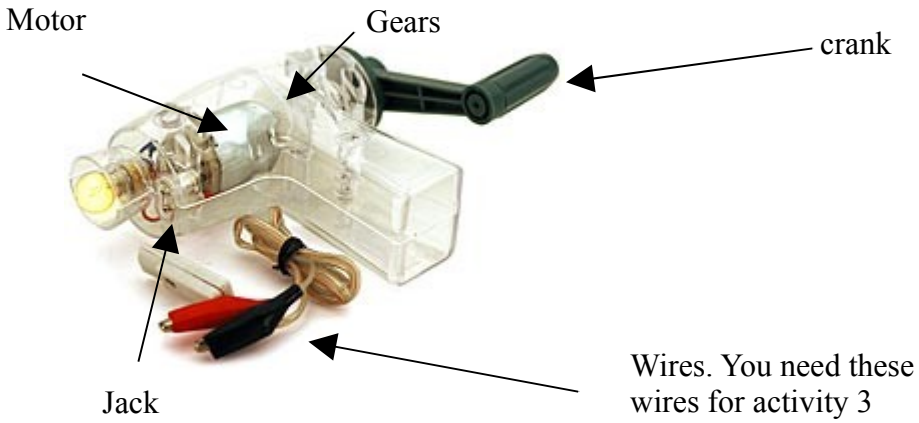
Materials

- two Potato clocks
- potatoes and other vegetables (not in the box)
- the hand held DC generator
- The accessory wires that comes with the hand held DC generator. You need this for activity 3
- the world's simplest motor



- **Did you know that your body burns the substances found in food?**
- **These substances are like fuel to keep you alive and active.**
- Use the potato clock to show them how food has energy. There are two probes extending from the clock module. To get it work insert the zinc probe (the metal with the black top) in one potato and the cooper probe (the metal with the yellow top) in the other potato.
- Next, use the other provided wire with attached probes. This time insert the yellow probe into the potato with the black probe. And insert the black probe into the potato with the yellow probe.
- In other words you should have one copper probe (yellow) and one zinc probe (black) in each potato.
- The probes should be half inch or less away from each other, but not touching.
- And it works!!!!
- Let the kids try it themselves. There are two clocks in the box so that four kids can try it at the time. Use different vegetables. Experiment what happen if you use other vegetables. You can use other things, like apples, bananas, lemons, grapefruits, cucumbers, grapefruit. Etc. The fruit has to be fresh to work. If the fruit is old and dried out, replace with fresh items.
- Ask: **What happens if the energy-supplying food that you eat is not used by your body?**
- **It might turn into fat, which is stored energy.**
- **Energy can be stored and used later. Stored energy is called potential energy**

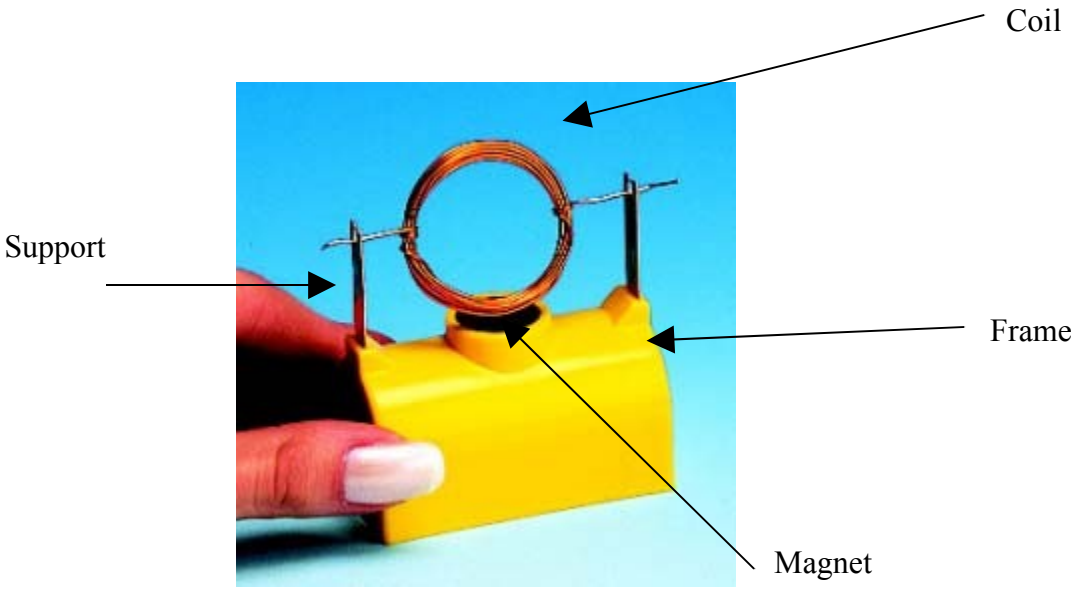
Activity 2:The hand held DC generator



- When you store energy as potential energy and then set it free, it is called energy of motion.
- Now let us use the potential energy you have, because you all ate breakfast today, to convert it into something else.
- You are going to used your stored energy (potential energy) and change it into motion energy and this is going to change into electrical energy.
- Please take a look at this machine. This is a DC (direct current) generator. This is a device that produces electricity.
- This kind of current is used in cars, locomotives, and some types of motors used in industry.
- All you have to do is turn the crank – then watch the mechanical energy you provide turn into electrical energy! (Let one of the children turn it while you speak.)
- Inside the machine you can see the gears that turn around and the motor. Inside the motor there is a magnet and copper wires in the from of a coil (like a ring of wires). There are also some cable that goes from the motor to the lamp.
- When you turn the crank the gears move.
- This gears make the magnet that it is inside the motor to spin. This magnet is producing energy. This energy is sent to the lamp through the coil wires and the lamp lights. All these happens as long as you are turning.
- So we are using your energy to create movement and this movement is being converted through the motor into electricity.
- What happened if you turn very slow? The bulb will not turn on.
- The faster the crank turns the brighter the light will become.
- In order to turn the light faster you need to use a larger force. So you have to work hard.

Give the machine to another children with lots of energy.
Let all the kids try it.

Activity 3: The world's simplest Motor



In the previous activity you used your energy to move the motor.

- In this activity the motor is being moved by a battery.

Here you will be able to show the kids how the motor works.
Materials:

- the plastic frame
- the battery
- the coil of wire
- and the magnet

- put the battery in the frame. Set the magnet in the middle of the frame as shown in the picture. Set the coil ends into the U of the supports. Give the motor a little push and your motor will begin to run.

- The energy is stored in the battery. This is creating forces that pushes and pulls the coil. This forces help to turn the motor which also can create current to turn on a bulb.
- To prove this you can go further to the next activity.

Activity 4: Using both machines

Materials

- The Hand- held DC Generator
- The wires that come with the H-and held DC Generator
- The World's Simplest Motor

THIS PART DO IT ONLY IF YOU HAVE TIME:
IN HERE THE MOTOR THAT YOU JUST SHOWED, WILL MAKE THE CRANK OF THE GENERATOR MOVE WITHOUT HUMAN FORCE AND WILL TURN THE BULB ON.

You need both machines. The Hand-held DC Generator and the World's simplest motor. You will also need the wires that come with the Hand-held DC Generator.

- Plug the wires into the jack of the Hand-held DC generator.
- Take the magnet out of the world's simplest machine.
- Take the ending parts of the wires that you just plug into the Hand-held DC Generator.
- Attached each ending part to the supports of the World's Simplest motor.
- Then, set the coil ends into the U of the supports of the World's Simplest Motor.
- Now hold the magnet above the coil. (You could leave it where it was, but then the motor will begin turning and you will have no control to stop the motor. If you hold the magnet above the coil, it will turn exactly as in the previous activity but by moving it away from the coil you will have control on when to make the motor to stop. Because no magnet means no movement.
- This time the motor of the World's Simplest Motor will turn the crank of the Hand-held DC generator and the light will turn on.
  How cool is that!

STATION 2: OTHER FORMS OF ENERGY

MATERIALS:

Activity 1: STATIC ENERGY

Materials:

- Sugar, salt, and pepper
- Small plate
- Balloons
- Piece of rug (children's cloth). Wear a wool sweeter yourself on that day.
- Wood sweater (wear one yourself)
- pieces of straws

Activity 2: HEAT ENERGY

Materials:

- the water balloons,
- the Coca-Cola bottle and the coin

Activity 3: SOLAR ENERGY

Materials:

- Radiometer
- Flashing lamp
- Projector lamp (use the one in the classroom)
- Mirror

Activity 4: WIND ENERGY

Materials:

- Box of saltine crackers (enough for each student)
  We will use index cards instead of saltine crackers. Please cut the index card to be the size of a saltine cracker. The effect is the same.

STATION 2: OTHER FORMS OF ENERGY

Introduction:

- Energy is the ability to work. You need energy to force an object to move. You need energy to make matter change. The blowing wind, the warm Sun and a falling leaf are all examples of energy in use. Energy makes motion and change possible.
- There are two basic types of energy. On is called kinetic or energy of motion. The other one is called potential energy. **Kinetic** is being used as an object is in motion. **Potential energy** is in storage just waiting to be used. Many things start out having potential energy, and then once they begin to move, the energy becomes kinetic. For example, a car parked in a driveway has potential energy. When the ignition is started and it drives away, the car gains kinetic energy as it moves. Can you think of another example of potential energy turning into kinetic energy?
- In this station we are going to take a look a different ways that energy is captured. This are called sources of Energy.

ACTIVITY 1: STATIC ENERGY

What is Static Energy?

Electrical charges can be negative (-) or positive (+). Opposite charges attract each other while similar charges repel each other. As electrical charges build up on a material, it creates static electricity.
Have you ever walked across a carpet and then touched a doorknob and got a shock? That is an example of static electricity. Can you think of another example? **(An example of this is lighting)**

MATERIALS

- Sugar, salt, and pepper
- Small plate
- Balloons
- Piece of rug (children's cloth). Wear a wool sweeter yourself on that day.
- Wood sweater (wear one yourself)
- pieces of straws

Sticky balloons (OPOSITE CHARGES ATTRACT EACHOTHER)

This is a very easy investigation that shows static electricity in action. Blow up some balloons and rub them hard on a wool sweater. Hold the balloons against a wall. The balloons seem to stick on the wall as if by magic. What is happening is that the static charges on the balloon different from the static charge on the wall, and opposite

charges attract one another. The balloons are held against the wall until the charge gradually leaks away and balloons slip to the floor.

Log Rolling (SIMILAR CHARGES REPEL EACHOTHER)

Put some drinking straws on a table. Charge the balloon again with static by rubbing it with a wool cloth. Hold the balloon close to the straws and watch them roll away. The straws and the balloon are both plastic and have the same static charge. Things with the same charge repel each other, so the balloon pushes the straws away.

How can Static Energy be used?

When coal is burned in a power plant, small particles of pollution called soot are produced. Static electricity can be used to capture soot before it leaves the power plant.

Picking up pepper

1. Rub the blown up balloons against a rug or on the children's clothing to give it an electric charge.
2. Put small amounts of sugar, salt, and pepper on a plate. Do not mix them together. Beginning a few inches above the plate, move the balloon closer to the particles. Observe to see if one type of particle reacts before the others.
3. Record your observations.
4. Repeat the experiment with the salt, sugar, and pepper mixed together.

Analysis and Conclusion:

Are the particles attracted to the balloon at different heights above the plate?
Can you separate a mixture of salt, sugar, and pepper using static electricity?
Could static electricity be used to clean the air at a coal-burning power plant?

Activity 2: HEAT ENERGY

Materials:

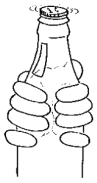
- the water balloons,
- the Coca-Cola bottle and the coin

Heat can be made when things rub together
We are going to make heat energy
Rubber Band Activity - Use the water balloons instead of a Rubber Band

1. Place your thumbs through the rubber band, one on each end. Without stretching the band, hold it to your forehead or lip. Does the band feel cool or warm or about the same as your skin? Repeat the test several times until you are sure of the result.

2. Move the rubber band slightly away from your face, so it is not touching your skin. Quickly stretch the band about as far as you can and, holding it in the stretched position, touch it again to your forehead or lip. Does it feel warmer or cooler or about the same as it did when it was relaxed?
3. Move the stretched rubber band away from you face. Quickly let it relax to its original size and again hold it to your skin. Does it feel warm or cool?
4. Repeat the stretching and testing, and relaxing and testing several times until you are sure of the results.

The Coin Activity – Use the bottle and the coin.



Lay the coin flat over the opening of the bottle.

Get the coin wet, you could put it under the faucet or place a few drops of water at the edge of the coin, to form a seal between the coin and the lip of the bottle.

Wrap both hands around the body of the bottle. Direct students to quiet themselves and focus their attention on the coin. The coin will begin to tap on the lip of the bottle. If the coin does not tap, warmed air might be escaping between the coin and the lip of the bottle. Add a few more drops of water.

Elicit explanations from students. Allow them to try different methods to increase the effect. (rubbing hands together to create more heat; or chilling the bottle)

Activity 3: SOLAR ENERGY

Materials:

- Radiometer
- Flashing lamp
- Projector lamp (use the one in the classroom)
- Mirror

Introduction:

Sunlight is responsible for many things, including the production of our food. Plants use the energy from the sun to drive the chemical change in the leaves of plants. Plants act as an energy converter, and the can change the light energy into chemical energy that plants use to grow.

This activity also demonstrate change. The energy of the light is converted into mechanical energy and into heat energy to make the vanes spin.

Procedure:

1. Use the Radiometer. Please be careful when taking it out of the box It is made out of glass.
2. Put your Radiometer under different light sources. A flashing lamp, sunlight, the lamps in the classroom, you can also use the desk projector lamp.

   Which light sources makes the Radiometer spin the fastest?
3. Hold the Radiometer in different positions so that light strikes it from different angles.
   What angel give the greatest motion to the vanes.
4. Use a mirror to add additional light to the Radiometer. Does a mirror increases the intensity?

The radiometer spins from the heat of the sun. The vanes in the radiometer are dark and light in color. The dark vanes absorb the rays and the light vanes reflect the rays.

This device was invented by Sir William Crookers in the mid-nineteenth century. The device was developed to measure the intensity or radiant energy or heat.

Radiometers are also used in meteorology, climatology and solar energy studies and in building physics.

Activity 4: WIND ENERGY

Materials:

- Box of saltine crackers (enough for each student)
  We will use card board instead of the saltine crackers. The effect is the same.

Introduction:
Wind can be used to do work. The kinetic energy of the wind can be changed into other forms of energy, either mechanical energy or electrical energy.

When a boat lifts a sail, it is using wind energy to push it through the water. This is one form of work.

Farmers have been using wind energy for many years to pump water from wells using windmills.

In Holland, windmills have been used for centuries to pump water from low-lying areas.

Wind is also used to turn large grinding stones to grind wheat or corn, just like a water wheel is turned by water power.

Today, the wind is also used to make electricity.

Blowing wind spins the blades on a wind turbine -- just like a large toy pinwheel. This device is called a wind turbine and not a windmill. A windmill grinds or mills grain, or is used to pump water.

The blades of the turbine are attached to a hub that is mounted on a turning shaft. The shaft goes through a gear transmission box where the turning speed is increased. The transmission is attached to a high speed shaft which turns a generator that makes electricity.

Directions:

1. Provide each student with an unbroken saltine cracker or a piece of card board instead.
2. Make sure the corners of the crackers or of the card are sharp.
3. Demonstrate how to hold diagonal corners of a cracker or card gently between your thumb and index finger, as shown in the picture below.
4. Blow on the outside corner and the saltine or card will spin like a turbine.
5. Direct the students to hold their crackers or cards very gently and blow on the outside corner. It might take the students a few attempts to master the technique.
6. Explain to the students that they are converting the energy in the food they have eaten into motion energy - the movement of air. The energy in the moving air is spinning the cracker or card.
7. Direct the students to blow very lightly, then harder and harder to see what happens.
8. Explain that windmills work on the same principle. The blades of a windmill convert moving air, called wind, into a spinning motion that spins a turbine. The turbine spins a magnet inside a coil of wire to produce electricity. (Just like the ones they will see or already have seen in Station 1)