Energy Activities

Target Grade Levels
Fourth - Seventh

Time
30 minutes

Materials
- watch or clock with second hand
- 2 thermometers
- 6 tart pans, 3 inches in diameter (one pan painted black)
- solar calculator
- desk lamp
- rock, about 4 inches high
- flat board, about 1 foot by 18 inches
- toy car
- newspaper
- 2 cups of ice
- paper cut into 3-inch by 6-inch strips
- paper cut into 3-inch by 2-inch squares (4 per experiment)
- tape
- unused pencil
- paper
- paper clips
- string

Knowledge and Skills (TEKS)
- Science:
  - Conduct experiments to learn about how energy works in our world;
  - Use scientific tools to collect, analyze, and record information to include dissecting equipment, calculators, riled equipment, computers, and probes;
  - Plan investigative procedures;
  - Observe changes that occur due to the forces of energy; and
  - Work in groups to explain the phenomena they observe.

Overview
Students will conduct experiments to learn about how energy works in our world, and observe changes that occur due to the forces of energy. Students will also work in groups to explain the phenomena 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 is the force that makes life possible. Trying to explain energy can be very difficult. These simple activities allow children to observe the effects of energy. With some guidance, the students can develop their own explanations for how these events happened, and, in the process, gain greater understanding of energy.

Procedure
1) Vocabulary
   a) energy
   b) potential energy
   c) kinetic energy
   d) gravity
   e) physical energy
   f) solar energy
   g) insulation
   h) work
   i) urban heat island
   j) chemical energy

2) Activities
   a) This activity is best conducted outdoors in an area protected from wind.
   b) After a discussion of energy and its various forms, direct your students in these energy experiments. Divide the class into two groups. Hand out the Energy Experiments worksheet.
   c) Have one group perform the solar, cooling, and heat experiments. Have the second group perform the gravity, physical, and insulation experiments.

d) Hand out the necessary materials to each group. Some experiments take longer than others. Students need to budget their time responsibly to complete each experiment.

e) Be available to assist your students in their experiments and explanations of what happened. Guide them through difficult explanations.

f) When all the experiments are completed, take a few minutes and have your students explain the experiments to each other. Have each group explain to the others what experiments they conducted and how they worked. Be sure they clean up the remains of the experiments.

g) When everyone is back in their seats, use this period 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.

3) Review

a) Discuss the concept of solar energy. How can students identify solar energy (light, heat) and how is it put to use (solar cells create electricity or heat water, used in cars, homes, calculators).

b) Discuss the concept of energy dispersion through cooling. Where did the heat go? Is that energy available to do other work now? How might trees and other cooling mechanisms (light colored roofs and pavement) help reduce the urban heat island effect and, hence, reduce ground-level ozone pollution?

c) Discuss the amount of physical energy it takes to move things and keep them moving. Relate this to the conversion of chemical energy in gasoline to physical energy used by an engine to move a car. It takes a lot of energy to move a 2,000-pound car with four people in it!

d) Discuss insulation and its use as an energy efficiency/energy conservation device. What items at home are insulated (e.g.: refrigerator)? What more should be insulated (whole house, water heater)?

4) Evaluation

a) Students can be graded on their record-keeping for experiments.

b) Students can be quizzed on vocabulary.

5) Extension

a) Discuss how solar energy is transformed into chemical energy through photosynthesis. Break down the ingredients of a pizza, which is fuel for the body, to see that their energy originated from the sun. (e.g.: Cheese comes from milk which is made by a cow which eats grass which captured its energy via photosynthesis of the sun's rays.)

b) There are a number of different units and terms associated with energy. Students can learn these units and terms and with which types of energy they are associated:

i) **calories (cal), kilocalories (kcal)** – chemical energy (e.g. stored as potential energy in food)

ii) **British thermal units (Btu)** – heat energy

iii) **kilowatt-hour (kWh)** – electrical energy

iv) **joule** – physical energy

c) Each time energy is converted, some energy is lost as heat. Students can research what are the most efficient energy conversions and which are the least efficient. (Examples of energy conversion: photosynthesis, burning gasoline in an engine, burning diesel fuel in an engine, digesting vegetables, digesting meat.)

Adapted from: "Energy Activities" *Alliance To Save Energy.* www.ase.org/educators/download.htm.

Energy Experiments

Name_____

Energy Experiment #1

Materials

- watch or clock with second hand
- 2 thermometers
- 6 tart pans, 3 inches in diameter (one pan painted black)
- water
- solar calculator
- desk lamp

Solar:

1) Solar energy creates electricity using solar cells. A solar calculator provides an example of this. Using the calculator, make a simple calculation. 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, in the sun. Fill both pans with exactly the same amount of water. After ten minutes, check the temperature of both pans. What are the differences? Why did this occur?

Cooling:

3) Place one aluminum pan with water in it in the sun. Place another in shade. After ten minutes, check the temperatures of the water in the pans. Which is warmer? Why?

Heat:

4) 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 minutes, check the temperature of each. Which is warmer? Why?

Energy Experiment #2

Materials

- rock, about 4 inches high
- flat board, about 1 foot by 18 inches long
- newspaper
- 2 cups of ice
- toy car

Gravity:

1) Place a board over a rock so one end is higher than the other. Place a toy car on the incline. What happens? Why? Try placing the board flat. Does the car move? Why not?

Physical:

2) Place a rock on the ground. What happens? Now place your hand behind the rock and push gently. The rock moves. What makes the rock move? _____

Insulation:

3) 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?