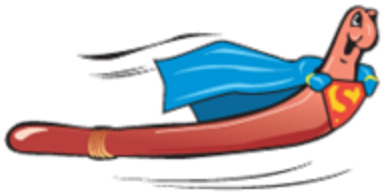


Energy Day: *Lesson Plan*

Compiled by Greg Martin and Laurelyn Sandkamp (Spring 2014)

Preparation:

1. Make sure you have all of your materials on hand (Materials List)

2. Write on flipchart paper:
   a. On one sheet: "A source of energy is Renewable…
      i. If its source cannot run out
      ii. OR if its source can be easily replaced.
   b. On next sheet: "A source of energy is Nonrenewable if…
      i. If its source is limited and will run out one day.
      ii. OR if it cannot easily be replaced.

3. Place two sets of shoeboxes for the "Renewable/Nonrenewable Energy Relay" at the other end of the space. In each set there will be one box labeled "Renewable Energy" and one box labeled "Nonrenewable Energy."

4. Place the cell phone charger, microwave, and laptop at different outlets around the room. Make sure there is a Kill-A-Watt meter with each of these three appliances as well.

5. Have the kids start out sitting at tables

1. Introduction (10 minutes):

"Hi, my name is __(leader 1)___ and this is __(leader 2)___, and this is _____, _____, _____. We are your Eco Team Leaders! Eco Teams is a fun investigation group that explores environmental issues facing everyone on the planet. We believe that kids have creative and helpful ideas for coming up with ways to live more sustainably and to help solve some of these issues; and that is why we are called an ECO TEAM. Together, we will be investigating issues and coming up with ways to be more earth-friendly. And, our mascot that helps get all this done is the earthworm, because earthworms are hard workers, turning the dirt under our feet into rich compost to grow plants in."

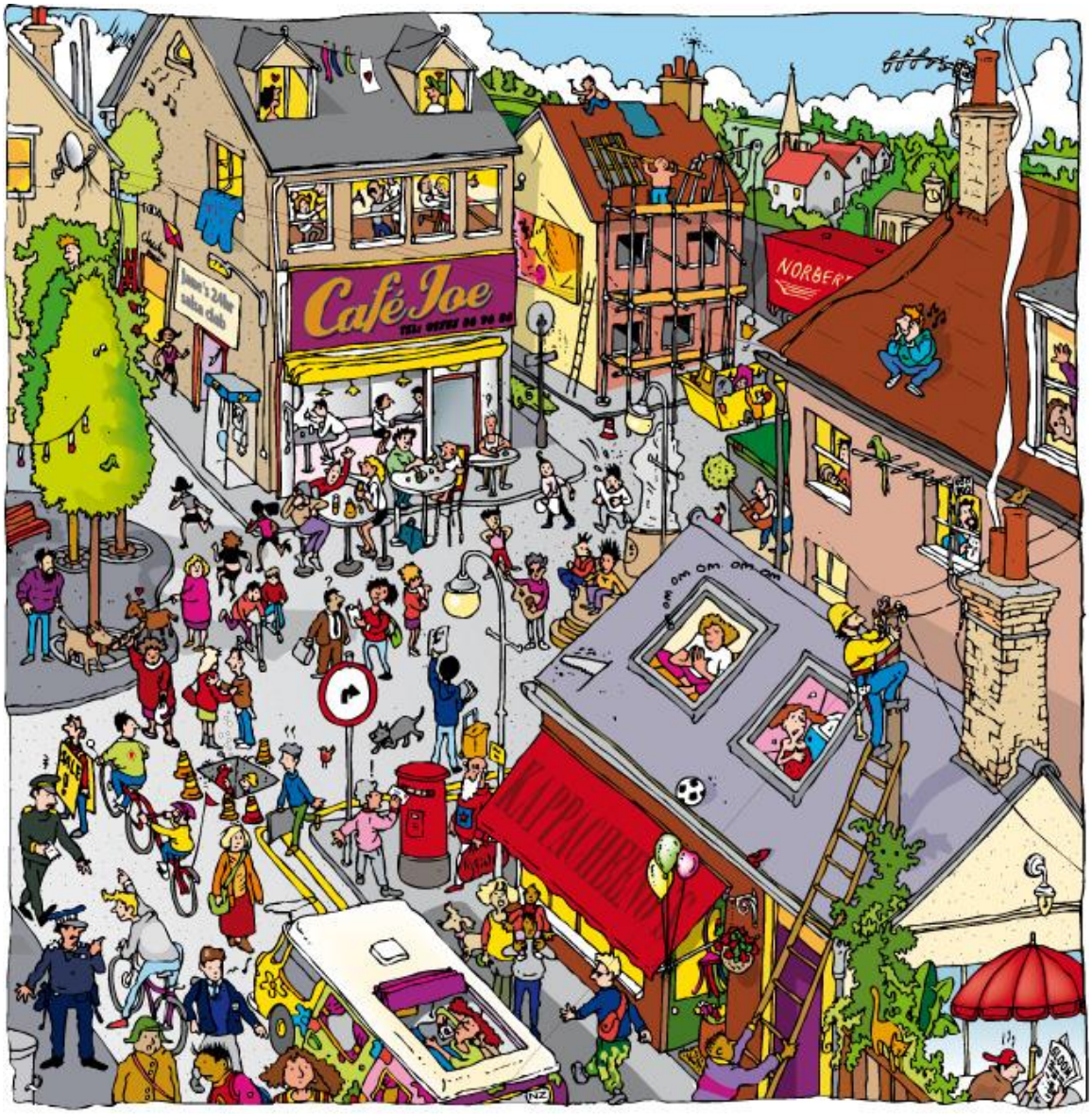
What is energy?

Look around you. Is anything moving? Can you hear, see or feel anything? Sure… this is because something is making something happen, and most probably, there is some power at work. This power or ability to make things happen is what we can call energy. It makes things happen. It makes change possible.

Raise your arms, wiggle your fingers. Where did you get the energy to do this? Breakfast, right? Wrong - the energy just passed through breakfast. Energy originated with the sun and has now reached you. Where is the energy now that you have let your arms down and stopped wiggling your fingers? You actually converted that energy to heat and transferred some of it to the air. Yep, you warmed the room up a tiny bit… All of the energy we need comes from the sun and plants are the original solar collectors.

**Hand out copies of the picture below. Ask each child to write down as many things as they can that are working, moving, or happening… with energy. They will have one minute.*

**After one minute, have each person compare with his/her neighbor.*



Energy moves cars along the roads and makes airplanes fly. It plays our music on the radio and lights our homes. Energy is needed for all living things to grow and move around.

2. Renewable Energy Sources: What is renewable energy? (5-10 Minutes)

Have any of you heard the words "Renewable Energy" or "Nonrenewable Energy"?

How do we know if a type of energy is Renewable or Nonrenewable? (use flipchart)

- A type of energy can be called "Renewable" when its source cannot run out or can easily be replaced.
- A type of energy is "Nonrenewable:"
    - When its source is limited and will run out one day.
    - When it cannot easily be replaced, for example if it took millions of years to form.

Can anyone name a source of energy?

**List each suggested source on the next page of the flipchart so everyone can see.*

**Briefly explain each source as it suggested (see table below), but do not specifically say whether the kind of energy is renewable or nonrenewable. After you describe each source of energy, ask the group to think about whether they think that source is renewable or nonrenewable.*

**Add and briefly explain the types of energy that were not suggested. The main sources of energy are:*

Fossil Fuels	• Many millions of years ago, prehistoric animals and plants died and were buried under layers of earth. The plant and animal remains biodegraded and the layers of earth squeezed and compressed these biodegraded remains. Under these conditions, what we call fossil fuels were created. • There is a limited supply of fossil fuels, for there is nothing to replenish the biodegraded products of prehistoric life. Once we use all the Earth's fossil fuels, we will have to find new sources of energy.
Natural Gas (Fossil Fuel)	• Natural gas is the least dense of the fossil fuels. We use natural gas for heat and cooking. It burns cleanest of all fossil fuels. • Natural gas is stored and piped to homes or industry under pressure. It is explosive under these conditions, and any spark or unintended temperature rise can set it off.
Gasoline and Oil (Fossil Fuel)	• Gasoline and oil are extracted from liquid fossil fuel, called petroleum. This is the fuel we burn when driving our cars and trucks. We burn oil for home heating and for generating electricity in oil-based power plants. • Much of the gasoline and oil we use we import from other countries. This is a huge expense for the United States. Tankers cross all the oceans of the world delivering this

	fuel. They regularly spill oil, doing great harm to ocean and coastal environments. The ocean contains plankton, which is the atmosphere's first most important source of oxygen.
Coal (Fossil Fuel)	• Coal is solid fossil fuel and is mined either underground or in open pit mines. We burn coal for home heating and for generating electricity in coal-based power plants. • Coal burns dirtiest of all the fossil fuels. Our use of sulfur-laden coal is responsible for much acid rain.
Wood	• Taken from forests, wood is a source of energy for home heating. In principle, wood is a renewable energy source, for we can renew forests by growing new trees. We rarely do this, however. • Destruction of forests results in erosion and permanent damage of the land, extinction of species that depend on forests for their habitats, as well as elimination of the second most important source of oxygen for our atmosphere. (Most important source: the marine food chain (especially phytoplankton) in the oceans.)
Nuclear Energy	• Certain heavy metals, uranium, and plutonium can have their atoms broken apart in chain reactions. We call this nuclear fission, and the process releases huge amounts of energy. We use this energy to generate electricity in nuclear power plants. • Nuclear power production, however, leaves radioactive waste products. These waste products are extremely poisonous and remain poisonous for a hundred thousand years. No community wants a radioactive waste dump anywhere near it, and we have no place to store these deadly wastes. In addition, accidents in the operation of nuclear power plants can result in radioactive materials escaping into the air and water around the power plant.
Hydroelectric Power	• We use the power of water flowing over a dam to turn large wheels called turbines. These wheels turn generators that create electric energy for homes and industry. • Hydroelectric power requires dams. Dams block rivers and flood all the land behind the dam. These dams destroy the river's ecosystems.
Solar Energy	• Solar means "from the sun." This energy is available almost everywhere. It can generate electricity by heating gas to drive turbines or generate electricity directly through photovoltaic cells.

	• Solar energy is clean and nonpolluting. It seems more expensive than fossil fuel energy. This, however, does not take into account the true costs of using fossil fuels, for when we pay for fossil fuels we are not paying (yet) for the harm their use is doing to the environment. • Solar energy is not a constant; it is not available at night or on cloudy and rainy days. There are methods for collecting and storing solar energy, and these methods are improving as our technology advances.
Wind Energy	• The energy of the wind can be used to generate electricity through the use of wind turbine generators (windmills). The use of wind power to generate electricity has many of the same advantages and disadvantages as the use of solar power. • Like solar power, it is free, unlimited, and nonpolluting. Similarly, it is not a constant, for it is not always windy. Again, methods for collecting and storing wind energy are needed, and these methods also are improving as our technology advances.
Source: Journey for the Planet: Coach's Guide (David Gershon, 2007)	

3. Renewable/Nonrenewable Energy Relay (10 Minutes):

To test our new knowledge and get us using our own human energy, we are now going to have a Renewable and Nonrenewable Energy Relay. We are going to divide you into two teams.

Each team member will take turns putting a card in the appropriate shoebox, "relay-style."

**Across the room, designate a "Renewable" box and a "Nonrenewable" box for each team.*

**Count the kids off by twos. Ask each team to come up with a team name.*

**Shuffle each pile of cards. Distribute each pile of cards among the members of each team. (Try to give an equal number to each child).*

Remember, It is more important to be accurate than fast, because your team's points depend on the number of cards your team puts in the correct pile. Only if there is a tie, then the team who finished the relay first would win.

**Do the relay and then ask the kids to sit back down.*

**Go through the cards and ask if it is a renewable or nonrenewable type of energy, and why. Count the points.*

4. Reflection (5 Minutes):

Where do you think most people get their energy from? Renewable or nonrenewable?

If most people get their energy from sources that are nonrenewable, that means we are going to run out of these types of energy at some point.

We can compare this to raisins. Does anyone here really like raisins? If you don't like raisins, think of something you really like to eat.

Ask one child who said he or she likes raisins: "If you had only one box of raisins and that was the last of the raisins available in the whole world, how would you eat those raisins? All at once, or would you try to save them?

Because most of our houses use nonrenewable energy, we all have a limited "box of raisins." Every time we turn on a light or get in a car to go somewhere it is like we are eating a little bit of those raisins.

5. Kill-A-Watt Meter (15 Minutes):

What types of appliances are at your house? Are they always plugged in?

Some devices use energy even when they are turned off. These devices are sometimes called "energy vampires."

Remember: It's an energy vampire if it has "active", "sleep/standby", or "off" modes. If it can only be turned on or off (like a lamp), then it is a regular electronic device.

- **"Active"** - Device is on and being used. (Example: a DVD player playing a movie.)
- **"Sleep/Standby**" - Device is in low-power mode. (Example: DVD player is on but not playing a movie.)
- **"Off"** - Device is turned off but still plugged in and ready for action. (Example: DVD player is turned off but could be turned on by remote control.)
- **"Power strip/ Unplugged"** - Device is plugged into a power strip, which is turned off at the end of the day. (Example: DVD player is receiving NO power.)
    - Ask students to think of as many electronic devices they use at home and at school that might be energy vampires.
    - Direct students to look around the room figure out if there are any energy vampires lurking.

Give each student a pencil and sheet with the names of the appliances in the room and two blank lines:

One line to write what they think the ranking of the appliances is in terms of energy usage
One line to write the actual wattage of each appliance as measured by the Kill-A-Watt Meter.
(See Appendix A for an example of this sheet)

Go around the room together testing out the three appliances.

Discussion:
Which appliances did you think would use the most energy? The least energy?
How were your findings different from what you thought they would be?

6. Speed Walking Relay (10 Minutes, optional if there is time):

When you drive, it costs you money, it pollutes, and it uses a nonrenewable resource.
Walking is free, healthy, and human energy is always renewable!

To celebrate our human energy we are going to have another relay - this time a speedwalking relay. Go back to your same teams from the first relay.

*Volunteers will be judges

7. Conclusion (10 Minutes):

Return to large group.

Thank you everyone for participating today! We did a lot and I hope you enjoyed learning about energy.

Share your knowledge with others about how to reduce pollution and save money by using less energy.
-Warn others about energy vampires!

Hand out boxes of raisins reminding the youth that these boxes represent the jars of candy we talked about earlier in the lesson. That means each box represents the amount of nonrenewable energy available. How will you use it?

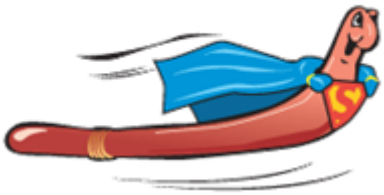
If there's time… each person will write three energy-saving choices they will make this week.

Sources:
http://www.eschooltoday.com/energy/kinds-of-energy/all-about-energy.html
Busy City Intersection Photo: http://thecreativefinder.com/portfolio-image.php?username=lephillou&id=21113&filename=Aldona-sample.jpg
Activity sources:
http://www.eia.gov/kids/resources/teachers/pdfs/Activitybook_web.pdf
http://www1.eere.energy.gov/education/pdfs/energyactionlist.pdf

Appendix A: Kill-A-Watt Meter Handout

Appliance Name	Rank what you think each appliance's amount of energy usage is (Rank of 1 = the highest amount)	What was the actual wattage you measured using the Kill-A-Watt meter?	What are the actual rankings?
1.			
2.			
3.			

2014 “Earthworms” Youth Eco-Teams Program



Thank you for participating in the Energy Unit!

Next week we will investigate what it means to be an Environmentally-Friendly Consumer!

Energy Saving Tips ... For Parents and Families!

No Cost Tips

These simple steps don't cost a thing, but can potentially save you 10-25% on your monthly energy bill.

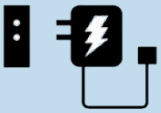
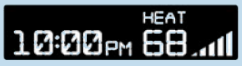
- Turn off lights and appliances when not in use. Don't forget your computer. Most new computers have sleep settings.
- In the cold months, set the thermostat to 68 degrees when home, and then back to 55 - 68 degrees when unoccupied.
- In the winter, open window coverings on the sunny side of your home to take advantage of free heat from the sun. Close the coverings on cloudy days or right after the sun sets.
- In warm months, set the thermostat to 78-80 degrees when home and 5 to 10 degrees warmer at night or when you're not home.
- In the cooling season, close blinds and drapes during the day to keep heat out.
- Also, use your dishwasher, clothes washer and dryer, and cook as late in the evening as possible.
- Set your water heater to 120 degrees.
- Vacuum your refrigerator coils (underneath and in the back) and don't obstruct the coils. They need air space.
- Keep the seals (gaskets) on refrigerators and freezers clean.
- Keep your freezer as full as possible.
- Make sure food is cool and covered before it goes into the refrigerator.

More No Cost Tips!

- Run full loads in your washer and dryer, and use "solar drying" (clotheslines).
- Use energy saver option on your dishwasher, allowing dishes to air dry.
- If your A/C unit is on the ground, keep the area around it clean and free of obstructions to maintain air flow.
- Unplug your televisions/VCR when you're on vacation. Most new sets draw power even when they're turned off.
- If your dishwasher has a filter, keep it clean.

THE EASY ENERGY ACTION PLAN CHECKLIST

10 SIMPLE WAYS TO USE ENERGY WISELY

		CHECK THE BOX
1	 Turn off lights.	☐
2	 Use energy-saving light bulbs.	☐
3	Shut off computers. 	☐
4	 Use "smart" power strips.	☐
5	Turn off entertainment devices when not in use (TV, game systems, etc.). 	☐
6	 Use natural light, heat and cooling.	☐
7	Unplug chargers when not in use. 	☐
8	 Talk to your parents about ENERGY STAR ® appliances.	☐
9	Talk to your parents about programmable digital thermostats. 	☐
10	 Talk to your parents about home improvements to save energy such as windows, doors, and roofs.	☐

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http://go.usa.gov/DVuQ

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