Energy Chain Scavenger Hunt

Summary

Students follow the transformations of energy. Like a choose-your-own-adventure, each form of energy can change into a variety of other forms, which lead to more and different transformations. This activity focuses on energy that begins as sunlight and eventually becomes heat and is lost.

Materials

Recording sheets (appendix B)	Pencils
Game direction cards (appendix A)	Clipboards (optional)

Procedure

1. Hand out clip-boards (optional) and pencils and worksheets. Make sure to have two copies of the game direction cards. Cut them out and tape it randomly in different parts of the room. *(Modification: You can also provide each student with a card and they can find each other to make the connections)*
2. Carefully and fully explain the procedure using an example sheet, this game can be confusing.
3. All the energy starts from the sun, then it can be changed into one of the listed forms (chemical, wind, electricity, falling water). The player finds a card with one of those four names on it. They write down that form of energy just found. They then write down what kinds of energy that could be changed into (the "to find" energies).
    - The player is now looking for one of the "to find" energies only and when he/she finds one he/she writes it down.
    - This should form a chain of one energy turning into another and another. Some chains are short and some are long. Try to get the students to find as many different chains as possible.
4. Have students do the front and the back of their worksheets - A total of 4 chains. This part should take about 15-20 minutes.
5. In the classroom draw out the chains on the board using arrows to link the energies through conversations with the students. See diagram in appendix C.
    - Fill in any missing links.
    - Eventually all energy is changed into heat and that heat escapes from the earth and into space.
    - We do not run out of energy because the sun continues to shine and input more energy to the earth.
6. Explain that each arrow represents a device (or process) that changes one form of energy into another.
    - E.g. a light bulb changes electricity into light.
7. Fill in all the devices represented by arrows.
    - Take time to explain what a turbine is and how it works, the shaking flashlight is a good way to demonstrate how an electric current is generated by a magnet moving across a wire.
8. Reinforce that energy is neither created nor destroyed; it can only change forms.
9. Extension: Have a class discussion on why many cultures worship or provide thanks to the Sun?

Credited to Sherri Owen - Science at a Run from STAO 2010

All activities were originally created to be used at the Camp Kawartha Outdoor Education Centre and the Camp Kawartha Environment Centre

Notes for the teacher:

Wind energy is actually a byproduct of the sun. The sun's uneven heating of the atmosphere, the earth's irregular surfaces (mountains and valleys), and the planet's revolution around the sun all combine to create wind. Since wind is in plentiful supply, it's a sustainable resource for as long as the sun's rays heat the planet.
https://www.energy.gov/eere/wind/wind-energy-basics

The amount of sunlight that strikes the earth's surface in an hour and a half is enough to handle the entire world's energy consumption for a full year. Solar technologies convert sunlight into electrical energy either through photovoltaic (PV) panels or through mirrors that concentrate solar radiation.

When light shines on a photovoltaic (PV) cell – also called a solar cell – that light may be reflected, absorbed, or pass right through the cell. The PV cell is composed of semiconductor material; the "semi" means that it can conduct electricity better than an insulator but not as well as a good conductor like a metal. There are several different semiconductor materials used in PV cells.

When the semiconductor is exposed to light, it absorbs the light's energy and transfers it to negatively charged particles in the material called electrons. This extra energy allows the electrons to flow through the material as an electrical current. This current is extracted through conductive metal contacts – the grid-like lines on a solar cells – and can then be used to power your home and the rest of the electric grid.
https://www.energy.gov/eere/solar/solar-photovoltaic-cell-basics

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Chlorophyll's (found in chloroplasts of plants) superpower isn't the ability to reflect green light—it's the ability to absorb blue and red light like a sponge. The sun's blue and red light energizes chlorophyll, causing it to lose electrons, which become mobile forms of chemical energy that power plant growth. The chlorophyll replenishes its lost electrons not by drinking water but by splitting it apart and taking electrons from the hydrogen, leaving oxygen as a byproduct to be "exhaled".

When plants have enough sunlight, water, and fertile soil, the photosynthesis cycle continues to churn out more and more glucose (the chemical). Glucose is like food that plants use to build their bodies. They combine thousands of glucose molecules to make cellulose (more complex chemical).

Nature, through photosynthesis, enables plants to convert the sun's energy into a form that they and other living things can make use of. Plants transfer that energy directly to most other living things as food or as food for animals that other animals eat.
https://asknature.org/strategy/how-plants-transform-sunlight-into-food/

Hydroelectric facilities leverage the sun's energy, which lifts water to great heights through evaporation, and the force of gravity as the water travels back to sea level. A dam creates a large reservoir of water with a significant elevation differential. The elevation difference between the water behind the dam and the river downstream creates potential energy that can be converted to mechanical energy from rotating turbines.

The simple design of a hydroelectric dam allows for 90% or higher conversion efficiency from the potential energy of the elevated water to electrical energy at the power house.2 This performance far exceeds the 30% to 40% efficiency typical for conventional thermal power plants, and doubles the efficiency of natural gas combined cycles.
https://stem.guide/topic/energy-from-falling-water/

Appendix A - Game Direction Cards

Wind *Find: Electricity or Motion*	**Food** *Find: Motion or Heat or 2nd Food*
Electricity *Find: Light or Motion or Heat or Sound*	**Fossil Fuel** *Find: Electricity or Motion or Heat*
Chemical *Find: Food or Bio-Mass or Fossil Fuel*	**Sound** *Find: Heat*

Bio-Mass (burning or rot) *Find: Heat*	**2^{nd} Food** *Find: Motion or Heat or Sound*
Motion *Find: Heat*	**Heat** *END - ALL ENERGY LOST TO UNIVERSE*
Falling Water *Find: Motion or Electricity*	**Light** *Find: Heat*

Appendix B - Recording Sheets

Device or Process		Energy	
	1st	**Sun**	To find: Electricity or Wind or Chemical or Falling Water
	2nd		To find:
	3rd		To find:
	4th		To find:
	5th		To find:
	6th		To find:

Device or Process		Energy	
	1st	**Sun**	To find: Electricity or Wind or Chemical or Falling Water
	2nd		To find:
	3rd		To find:
	4th		To find:
	5th		To find:
	6th		To find:

Device or Process		Energy	
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Device or Process		Energy	
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	5th		To find:
	6th		To find:

Appendix C - Energy Map Sample