**How Do You Use Energy?**
Grades 5-8 Saturday Science Lesson Plan

**Objectives:**

* Students will be able to begin to build a working knowledge of the different forms of energy: thermal, electrical, radiant, chemical, kinetic/mechanical, and sound energy.
* Students will be able to understand that objects can contain or produce more than one form of energy.
* Students will be able to identify how they consume and produce energy in everyday life.

**Standards:**

* 6.3.17 - Recognize and describe that energy is a property of many objects and is associated with heat, light, electricity, mechanical motion, and sound. **(Core Standard)**
* 7.3.14 - Explain that energy in the form of heat is almost always one of the products of an energy transformation, such as in the examples of exploding stars, biological growth, the operation of machines, and the motion of people. **(Core Standard)**
* 7.3.15 - Describe how electrical energy can be produced from a variety of energy sources and can be transformed into almost any other form of energy, such as light or heat. **(Core Standard)**
* 8.3.13 - Explain that energy cannot be created or destroyed but only changed from one form into another. **(Core Standard)**
* 8.3.15 - Identify different forms of energy that exist in nature. **(Core Standard)**

**Teacher Content Knowledge:**

Teachers should have a strong understanding of…

* The different forms of energy - mainly thermal, electrical, radiant, chemical, kinetic/mechanical, and sound energy. In order to be able to identify the different forms of energy and explain each to students, the teacher should look up age-appropriate definitions (typically found in students’ textbooks) and concrete examples. Examples should include objects that contain only one type of energy *and* objects that contain more than one type of energy.
* How to identify ways in which students use different forms of energy. The teacher should think about ways in which he/she uses energy to offer as examples\* and then place him/ herself in the students’ shoes and brainstorm ways in which they use energy as well.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*\* It is important to come prepared with examples for the students, but some simple examples should be left for students to suggest to their classmates, allowing them to make meaning on their own and to learn from their peers.*

**Materials List:**

*\* It is important to have enough of the following materials for each student.*

* 6 Paperclips
* Small Amount of Clay
* 2 Shelled Walnuts, Peanuts, or Cashews
* Two Paper Cups
* 30 cm of String
* 1 Metal Coat Hanger
* 1 Pencil
* Wires, Batteries, and Light Bulbs (used to build a small circuit that will light the bulbs; amount needed will vary depending on the size of the circuit)

*\* It is only necessary to have one set of these for the entire class unless you are dealing with a large class size.*

* 1 Lighter or 1 Matchbook
* 4 Thermometers
* 4 Jars *with* Lids
* Ice

**Lesson:**

This unit will consist of four short activities that will be used to introduce students to different forms of energy. Before each activity, students will brainstorm ideas of what types of energy they will be learning about through the activity. The students will be given time to explore the materials provided to them and complete the activities. Afterwards, the teacher and students will discuss what form of energy or energies were explored and think of ways they produce or consume these energies in their lives. Students will write in their science journals during each activity and will be required to write down at least two things they learned about each form of energy and at least two examples of how they experience each energy in their everyday lives.

**Engage:**

In order to get the students thinking about energy, the teacher should have the students brainstorm their ideas about how to identify and classify energy and list their ideas on the board. Once the students feel they have a strong list, they will watch this video:

<http://www.youtube.com/watch?v=z7lCkQV7GEE&feature=related>

The students will then alter their list of ideas after viewing the video. The students should record their original ideas and their new ideas in their journals. They will be adding information throughout the activities.

**Explore/Explain/Elaborate:**

The Explore portion of the lesson plan occurs when the students participate in the activities. The Explain portion of the lesson plan happens throughout the lesson and therefore during each activity. And finally, the Elaborate portion occurs when the students apply their understandings and definitions of the different forms of energy to their everyday ideas. Specifically, students think about what activities and experiences they have had with the different forms of energy.

*\* The activities below do not have to be performed in any specific order.*

**Activity 1: Thermal Energy**

This can be done with any number of jars placed under multiple conditions. The activity below uses four jars and four thermometers. Each of these four jars will be placed under a different condition.

**Jar 1:** A thermometer is placed inside the jar and the lid is left off.

**Jar 2:** A thermometer is placed inside the jar and the lid is screwed on top.

**Jar 3:** The jar is filled half way with water and a thermometer is placed inside. The lid is screwed on top.

**Jar 4:** The jar is filled half way with ice and a thermometer is placed inside. The lid is screwed on top.

Students will predict how the temperature change will vary between the jars. Every 5 minutes for a 20-minute period, students will check the change in temperature. Students will record their findings in a chart in their journals. Once the allotted time has passed, students will compare the data they have collected and will hopefully see that each jar experienced a different amount of change. They will be asked to express their ideas about why that happened. After the conversation has been exhausted, students will learn that different objects give off different amounts of *thermal* energy and therefore alter the temperature of the surrounding environment. (Warmer objects give up energy to colder objects.) The conversation will then move to how students experience thermal energy in their everyday lives (e.g., boiling water to cook, taking their temperature, the changes in outside temperature during the course of a day).

**Activity 2: Chemical Energy and Radiant Energy**

For this activity students will use the wires, batteries, and light bulbs. To begin, present the students with the question, “How can you use these materials to light up the light bulb?” Give the students about five minutes to explore the materials. If one or more students are able to light the bulb, allow them to share with their peers. Once the students have had time to explore, the teacher should show a couple more ways (with multiple batteries, multiple light bulbs, etc.) to make a circuit. After the activity is over, the teacher should discuss with the students what types of energy are produced/consumed when a circuit is complete. The students will discover that *chemical* energy is consumed through the use of the batteries to complete the circuit and *radiant* energy is produced when the light bulb is lit. The conversation will then move to how students experience chemical energy and radiant energy in their everyday lives (ex. using batteries in a watch, turning the lights on in their bedrooms, the sun, etc.)

**Activity 3: Sound Energy**

Each student will receive two paper cups. They will attach 30 cm of string to the two paper cups by poking a hole through the bottom of the cups (which can be done with scissors or a pen point), threading the string through, and then tying a paper clip to the ends of the string in order to make sure the string does not come loose. The free ends of each of the two strings that are attached to the cups will be tied to the end of a metal coat hanger. The students will then hold one cup to each ear so that the hanger is hanging vertically. The teacher or another student will tap the coat hanger lightly with a pencil and the student holding the cups will observe the sound. Then the teacher or another student will hold another hanger beside the one attached to the cups. The helper will then tap the unattached hanger and then tap the first while the listener still holds the cups to their ears. Each student will take a turn in order for them to have an equal opportunity to listen and observe any difference that may occur. The students will then learn that they just experience *sound* energy and that this form of energy travels in waves. The conversation will then move to how students experience sound energy in their everyday lives (e.g., listening to the radio, hearing construction outside, shouting, etc.).

**Activity 4: Chemical Energy, Thermal Energy and Kinetic Energy**

The students will bend a paper clip and stick the end of it into a small amount of clay in order to make a stand that can support a shelled peanut, walnut, or cashew. (The nut should be about 2 or 3 cm above the table top.) The students will then place the nut on the stand. The teacher will then walk around the room and light each of the nuts on fire with a lighter or matches. The students will observe how long their nut burns. Stopwatches can be used during this activity but an exact measurement of time is not necessary. Each student will describe about how long their nut burned; as a class they will brainstorm where the heat that is produced is coming from. Once the students have had time to brainstorm, the class will discuss that the *chemical* energy that is stored in the nuts is being converted into *thermal* energy. Also, students should realize that they and other animals use the chemical energy that is present in food in order to live and produce *kinetic* energy. The conversation will then move to how students experience kinetic energy in their everyday lives since they will have already discussed how they use thermal energy and chemical energy (e.g., playing on the playground, walking up steps, brushing their teeth, etc.).

During the activities and at the end of all the activities, the students will be allowed to ask questions and inquire about things that they are interested in learning more about in later lessons.

**Evaluate:**

The students will be evaluated based on their journal entries. As mentioned earlier, the students are responsible for writing their original and new ideas about the definition of energy. Also, for each activity, students should be held responsible for writing at least two things they learned about each form of energy and at least two things about how they use it in their everyday lives. Their responses will be evaluated based on how well they show their understanding and upon the effort the student put into creating their responses.