**4th Grade PBL**

**Energy**

**Standard 4.PS3.3** Describe how stored energy can be converted into another form for practical use.

**1. Hook:** Teacher will brainstorm with students a list of ways that some people may use energy on a daily basis. Predict which energy source is being utilized based on the energy use. After the video and discussion, revise the predictions.

**2. Watch** the following video and answer some/all of the discussion questions (this can be done orally or as a journal entry). Be sure to discuss the conversion of energy sources.

<https://tn.pbslearningmedia.org/resource/phy03.sci.phys.energy.energysource/energy-sources/#.WzVpRIjwbIU>

1. Choose an energy source. What are the benefits and drawbacks of using this source?
2. List all of the energy sources and divide them into two categories: renewable and non-renewable.
3. What is the main source of energy in the United States?
4. Think about all the situations in which you use energy in your everyday life. What is the source of energy in each case? If you don’t know, how could you find out?

**Activity 1:**

1. Review potential and kinetic energy before beginning this activity.

2. Ping Pong Ball Shooters

* 1. Watch the following video to gain interest:
		1. <https://www.youtube.com/watch?v=CRDmP69TYJ0>
	2. Students will create their own ping pong ball shooter to demonstrate the conversion of energy.
		1. Cut the bottom off of your cups (you may want to have this done prior to lesson).
		2. Wrap the cut edge of the cup with tape (washi tape adds a colorful, fun look). Be sure to fold the edge of the tape over the edge of the cup to form a smoother barrier.
		3. Tie off the end of a balloon in a knot. The balloon should not be blown up. It should be deflated.
		4. Cut off the top of the balloon and stretch the knotted end over the un-taped part of the cup. Students may need help stretching the balloon over the cup. It may be helpful to have another individual hold the cup while the balloon is being stretched.
		5. Placed the ping pong ball inside of the cup and pull back on the knotted balloon. When you let go the ball will shoot across the room.

**Activity 2:**

1. Students will read and answer the questions that go along with the following article.

* 1. <https://newsela.com/read/elem-sci-energy/id/29720/>
		1. Be sure to differentiate the instruction by selecting the appropriate Lexile Level.
		2. Questions can be answered individually or as a whole group discussion.
	2. Holiday Light Circuits
		1. Students will create a circuit that will successfully light up a lightbulb from a string of Christmas lights
			1. Prep the lights by cutting the lights apart and scoring the bottom of the wires (this can be done with scissors, or a simple pair of wire strippers).
			2. Cut the aluminum foil into strips (this will serve as the wires within the circuit that students will create).
			3. Use the brass fasteners as a switch and the 9-volt battery as the power source.
			4. <https://nittygrittyscience.com/stem-activity-holiday-light-circuits/>
			5. Feel free to experiment with other energy sources (i.e. potatoes, citrus fruits, play dough, etc.)
	3. Potato Clock
		1. [https://www.amazon.com/gp/product/B001TR2DEE/ref=as\_li\_tl?ie=UTF8&camp=1789&creative=390957&creativeASIN=B001TR2DEE&linkCode=as2&tag=creekslearni-20&linkId=6E2UKUSYJKXHO7YC](https://www.amazon.com/gp/product/B001TR2DEE/ref%3Das_li_tl?ie=UTF8&camp=1789&creative=390957&creativeASIN=B001TR2DEE&linkCode=as2&tag=creekslearni-20&linkId=6E2UKUSYJKXHO7YC)

**Activity 3:**

1. Watch the following video regarding wind energy.

* 1. <http://www.switchenergyproject.com/topics/energyresources>

2. Wind Powered LED

* 1. Potential field trip to IMAX theater to watch Dream Big film
		1. Currently playing at the Pink Palace Museum in Memphis, TN;

Tennessee Aquarium in Chattanooga, TN.

* + 1. <https://www.dreambigfilm.com/>
	1. Students will create and test a wind mill to perform for a practical use. The practical use will be tested through the lifting of washers.
		1. Follow steps and lesson given below.
		2. <https://www.dreambigfilm.com/education/>
		3. Kid Wind Mini-Turbine
			1. [https://www.amazon.com/s/ref=nb\_sb\_noss\_2?url=search-alias%3Daps&field-keywords=kidwind+mini+turbine+kit&rh=i%3Aaps%2Ck%3Akidwind+mini+turbine+kit](https://www.amazon.com/s/ref%3Dnb_sb_noss_2?url=search-alias%3Daps&field-keywords=kidwind+mini+turbine+kit&rh=i%3Aaps%2Ck%3Akidwind+mini+turbine+kit)

**Activity 4:**

1. The following video discusses geothermal energy and how it can be used.

* 1. <http://www.switchenergyproject.com/topics/energyresources>

2. How Heat Works

* 1. The following experiment helps to show how heat affects things and how it works.
		1. You will need three clear jars. Label each jar: room temperature, cold, and hot water.
		2. Fill each jar ¾ of the way full with the corresponding water (room temperature about 72°, cold water about 40°, and hot water about 100°).
		3. Give students a prediction sheet. Students will formulate a prediction on what they think will happen when you put a drop of food coloring into each jar.
		4. Put one drop of food coloring into each jar and allow students to revise their predictions on their sheet. Discuss as a whole group.

3. S’more About Thermal Energy

a. Read the following book to students before the next activity: *Scaredy Squirrel Goes Camping*

i. [https://www.amazon.com/Scaredy-Squirrel-Goes-Camping-M%C3%A9lanie/dp/1894786866/ref=sr\_1\_9?ie=UTF8&qid=1530234007&sr=8-9&keywords=scaredy+squirrel](https://www.amazon.com/Scaredy-Squirrel-Goes-Camping-M%C3%A9lanie/dp/1894786866/ref%3Dsr_1_9?ie=UTF8&qid=1530234007&sr=8-9&keywords=scaredy+squirrel)

b. The students will create, and design an oven that is energized by the sun’s heat. They will “cook” a s’more inside of the “oven”.

i. Give students a culmination of adequate “oven” proto-type supplies (e.g., cardboard boxes, aluminum foil, saran wrap, tape, etc.) along with the recipe for s’mores.

ii. Students will work in small groups to design and create their oven to cook the s’mores.

iii. Allow for class discussion on what worked and what didn’t and why to determine the best materials that conducted the sun’s thermal energy.

**Activity 5:**

1. Watch the following video regarding solar energy.

* 1. <http://www.switchenergyproject.com/topics/energyresources>

2. Sun Tea

* 1. Before steeping start by putting some simple syrup in the jar.
	2. Use about six tea bags for a ½ gallon jar.
	3. Hold the strings of the tea bags together and drape them over the side of the jar.
	4. Fill the rest of the jar up with water and screw on the lid.
	5. Allow students to make observations as the time progresses.
	6. It may be interesting to complete at different times of day to see the strength of the sun throughout the day.

**Assessment:**

1. Energy Conversion Comic Strip

* 1. Students will create a comic strip that shows their knowledge of how stored energy can be converted into another form for a more practical use.
	2. Students must be creative and original with their piece; therefore, they should use the activities and lessons as a guide, but cannot copy the exact scenarios.