Subject Area: Physical Science  
Grade: 8

Standards (Content and Characteristics):

S8P2. Students will be familiar with the forms and transformations of energy.  
   c. Compare and contrast the different forms of mechanical, heat, electrical and magnetic energy and their characteristics.  
   d. Describe how heat can be transferred through matter by the collision of atoms (conduction) or through space (radiation), in a liquid or gas, currents will facilitate the transfer of heat (convection).  

S8CS1. Students will explore the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.  
   a. Understand the importance of—and keep—honest, clear, and accurate records in science.  
   b. Understand that hypotheses can be valuable even if they turn out not to be completely accurate.  

S8CS5. Students will use the ideas of system, model, change, and scale in exploring scientific and technological matters.  
   a. Observe and explain how parts can be related to other parts in a system such as the role of simple machines in complex machines.  
   b. Understand that different models (such as physical replicas, pictures, and analogies) can be used to represent the same thing.  

S8CS7. Students will question scientific claims and arguments effectively.  
   b. Identify the flaws of reasoning in arguments that are based on poorly designed research (e.g., facts intermingled with opinions, conclusions based on insufficient evidence).  
   d. Recognize that there may be more than one way to interpret a given set of findings.  

S8CS8. Students will be familiar with the characteristics of scientific knowledge and how it is achieved.  
   Students will apply the following to scientific concepts:  
   a. When similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, which often requires further study. Even with similar results, scientists may wait until an investigation has been repeated many times before accepting the results as meaningful.
S8CS9. Students will understand the features of the process of scientific inquiry.

Students will apply the following to inquiry learning practices:

a. Investigations are conducted for different reasons, which include exploring new phenomena, confirming previous results, testing how well a theory predicts, and comparing different theories.

Enduring Understandings:

- Energy cannot be created or destroyed, but only changed from one form into another.
- Energy appears in different forms such as mechanical energy, gravitational energy,
- Heat energy, and electric and magnetic energy.

Essential Questions:

- How is energy transferred in my home?
- How do stereo speakers work?

Pre-Assessment:

Prior to instruction have students define, describe, or give examples for each form of energy. Teacher will use pre-test results to plan direct instructional based on needs of the students.

1) “Place –Mat” as a pre-assessment tool: Place a large piece of butcher paper or other large sheet of paper in the center of a group of students. Draw a “Place Mat” figure, as shown below, in the center of the paper. Have as many sub-divisions / squares depending on the number of students in the group that are to use the place mat. Students are then asked to write as much as they know about the center topic “How energy is transferred in my home?” or have a different question / topic for each group “Place Mat”.

Figure 1: A Place Mat
2) Download and play the *Energy Change Game* on the *Smartboard*. Have individual students write down answers before volunteers check their response on the *Smartboard*. The game has the students identify the energy in and out of different objects.

3) If technology is not available the teacher can produce a paper copy of the quiz or use a KWL on forms of energy.

4) A website worth checking to discuss energy changes: [http://www.fi.edu/guide/hughes/energychanges.html](http://www.fi.edu/guide/hughes/energychanges.html)

Have students discuss:

- Tasks that can be done with the use of energy (forms of energy) such as; cars move along the road, bake a cake in the oven, play our favorite songs on the radio, and light our homes. Energy makes our bodies work and allows our minds to think.
- For centuries, people have learned how to use available sources of energy by changing it from one form to another to do work more easily and live more comfortably. Most obvious examples of energy changing from one to another are seen in our homes.
- [http://www.fi.edu/guide/hughes/energytypes10.html](http://www.fi.edu/guide/hughes/energytypes10.html) This website is a very helpful, interactive and informative website on energy and its applications in our daily activities.

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<th>ANALYTICAL</th>
<th>PRACTICAL</th>
<th>CREATIVE</th>
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<tr>
<td>Correctly identify energy forms and transformations in a working model.</td>
<td>Correctly identify energy forms and transformations in a real world machine.</td>
<td>Correctly identify energy forms and transformations in a unique fictitious <em>Rube Goldberg</em> design.</td>
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<td>Have students watch the video <em>We Use Power</em> found on the <em>Energy Quest Website</em> <a href="http://www.energyquest.ca.gov/movieroom/index.html">http://www.energyquest.ca.gov/movieroom/index.html</a></td>
<td>Explain that energy exist in many forms; heat, mechanical, electrical, magnetic, etc. and that energy can be changed from one form to another. Discuss how speakers work by taking electronic signal stored on things like tapes, CDs and DVDs and changing it back into actual sound that we can hear.</td>
<td>Discuss the Law of Conservation of Energy. Discuss energy transformations. Some examples are: Candle (chemical to light) Microwave (light to heat) Guitar (mechanical to sound)</td>
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<td><em>Teacher role?</em></td>
<td><em>Student role?</em></td>
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<td>Supply the students with the materials to make the electric motor from understandings of the</td>
<td>The video illustrates the types of energy we use in our daily lives and how the energy is transformed.</td>
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video (battery, insulated electric wire, large nail, cardboard, paperclips, pencil, modeling clay). Have the students make a working model of the machine.

Discuss the Law of Conservation of Energy. Explain that energy can exist in many forms. Each form of energy can be transformed into another form to serve a useful purpose. Using examples from the video (steam engine, electric motor, water mills, etc) have the students identify the form of energy going in and the form going out. Also discuss how some energy is turned to heat in most machines. Have the students design and construct a machine that completes a simple task.

Have the students share their machines with the rest of the class. Students should explain how their machine works by identifying the energy forms and transformations in their machine.

Speakers Work
http://electronics.howstuffworks.com/speaker.htm

Explain the Law of Conservation of Energy. Discuss some of the most obvious examples of energy changing from one form into another can be found in our homes. Have students pick three machines/appliances to research. Students are required to explain how the machine works by identifying the types of energy used in the machine and by describing any of the energy transformations that take place. Students will create a presentation and present their research findings to the class.

Website Resources
How Things Work-Physics of Everyday Life
http://htw.wiley.com/htw/

How Stuff Works
http://www.howstuffworks.com/

Energy Quest
http://www.energyquest.ca.gov/how_it_works/index.html

Rube Goldberg was an award-winning cartoonist, who drew machines and contraptions of marvelous complexity and creativity to perform basic tasks. Goldberg’s name has become associated with any crazy apparatus that performs a simple task. Have the students create a large, colorful, drawing of a Rube Goldberg device that uses 10 different forms of energy and energy transformations to complete a simple task. Students should label energy forms and their transformations. Arrows should indicate the direction of energy flow. Later, they should share their work with the class.

Resources
Use website listed above.

Use websites listed above.

Use Interactive Whiteboard
And website listed above.
### Homework/Extension

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<th>Task</th>
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<td>Brainstorm the class for every possible type of energy. Make a list</td>
<td><strong>Homework/Extension</strong> Brainstorm the class for every possible type of energy. Make a list of the types on the whiteboard. Explain that there are 6 types of energy in the 8th grade standards (heat, light, electric, magnetic, mechanical motion and sound). Have students work with a partner to create a presentation (PowerPoint, Moviemaker, role play, collage, etc) that defines, explains, illustrates, lists examples of, and compares and contrasts the 6 forms of energy. Web resource - The Secret Lives of Energy <a href="http://www.fi.edu/guide/hughes/energytypes10.html">http://www.fi.edu/guide/hughes/energytypes10.html</a></td>
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<td>Have the students create a time line of energy and explain the</td>
<td><strong>Instructional Tasks Accommodations for ELL Students</strong> Provide a graphic organizer to display the requirements: define, explain, illustrate, list examples of, and compare and contrast the 6 forms of energy. For students struggling with this activity, provide a graphic organizer that is partially completed (provide an illustration of each form of energy, list examples for them). Instead of working with just one partner, assign ELL students to work with 2-3 other students for Activity-1 presentation. The teacher may pre determine the assignment of the individual students’ responsibility in the group. Allow the ELL student to focus on preparing just that requirement with the option of performing minimal speaking tasks in front of the class. For example, the ELL student could choose to research and define examples of any two of the six forms of energy and present in a form that requires minimal speaking. For the Activity 3 experience teacher may want to keep the ELL student in the same group as Activity-1. The ELL student could research a specific aspect of the invention that would require minimal speaking in front of the class. *** Teachers should consider using the free services of <a href="http://readplease.com">readplease.com</a> (specifically readplease 2003) which takes text in the student’s language from web pages and converts it to speech. Also, <a href="http://migrant.org">migrant.org</a> and <a href="http://visionlearning.org">visionlearning.org</a> are free resources for teachers to incorporate in the lesson plans involving Internet research.</td>
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<td>Have the students make flashcards of objects that illustrate energy transformation and explain to their peers the transformations. (The flashcards can be virtual. Here is a site that lets you make virtual flashcards. <a href="http://www.scholastic.com/kids/homework/flashcards.htm">Scholastic Flashcard Maker</a>)</td>
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### Instructional Tasks

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<td>Activity 1 - Students with organizational difficulties will need graphic organizers for data collection on defining, explaining, illustrating, listing examples of, and comparing/contrasting the 6 forms of energy in order to prepare for a presentation.</td>
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<td>Activity 3 (practical) - For students with reading deficits, reading through research (especially with unfamiliar vocabulary) can be frustrating. The teacher may need to guide the students' search to include inventions of a high interest area with which the student may be familiar (such as cars). Students with reading disabilities and/or visual impairments may need to make use of the free services of <a href="http://readplease.com">readplease.com</a> for help in navigating through this Internet site. Students with these disabilities frequently have reading software such as &quot;read aloud&quot; installed in a school's computer, but copyrighting may limit the use to one computer (for the student's class that requires the most frequent Internet use). Teachers should consider using the &quot;print screen&quot; key on a computer to take screen pictures of each page of this activity. Once the &quot;print screen&quot; key is pressed, the Internet page being viewed is saved onto the clipboard. Open a power point or word document and paste the Internet page into it. Clarifiers can be written on each Internet page of this activity and given to students ahead of time if necessary. The activity can be accommodated in this manner so that the student clicks only on the buttons that the teacher has highlighted on the hard copy. Teachers should consider using the free services of <a href="http://picasa.google.com/">http://picasa.google.com/</a> for more extensive editing of screen shots, such as cropping, enlarging, highlighting, etc.</td>
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### Instructional Tasks

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<th>Accommodations for Gifted Students</th>
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<tr>
<td>Have students design, draft, and construct a working model of the Rube Goldberg diagram poster.</td>
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<td>In order to stimulate ideas, pupils will enjoy watching a number of videos demonstrating various Rube Goldberg like contraptions. The videos are available at the following sites: <a href="http://video.google.com/videoplay?docid=6036778691140676165">http://video.google.com/videoplay?docid=6036778691140676165</a></td>
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