

## Extending “Fun With Energy” In Your Classroom

Meets  
Next Generation  
Science  
Standards

This study guide is meant to build on the enthusiasm and curiosity of your students about energy in all its forms after watching or participating in the “Fun With Energy” presentation.

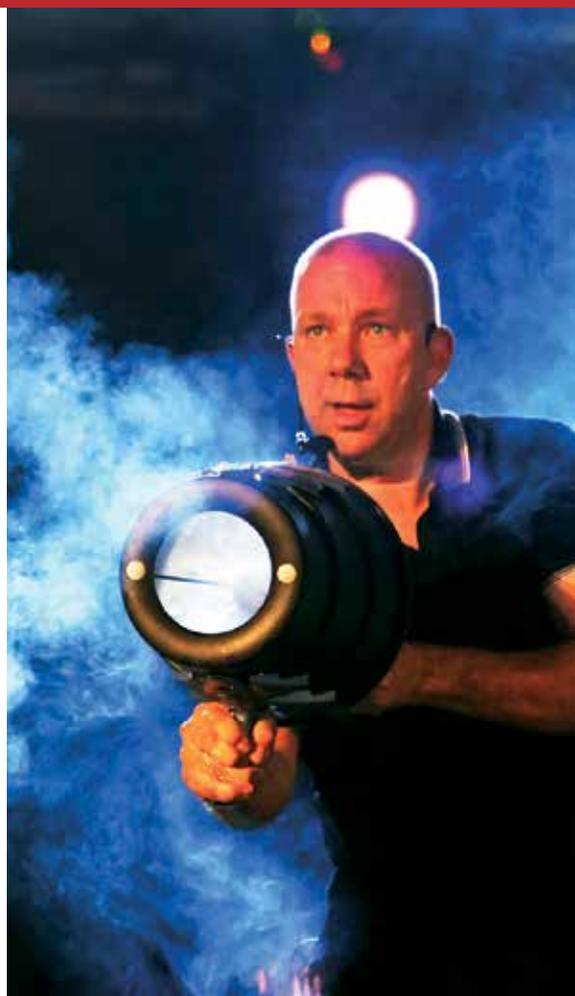
These activities are fun and engaging and can act as an introduction to the scientific principles they demonstrate. They also meet Next Generation Science Standards for each grade level.

### ACTIVITIES FOR GRADES 3-4

#### TRANSFER OF ENERGY

##### Next Generation Science Standards

- |                  |  |
|------------------|--|
| PS2B             | Types Of Interactions  |
| PS 3A            | Definitions of Energy  |
| 4-PS3-2, 4-PS3-3 | Energy can be moved from place to place by moving objects or through sound, light, or electric currents.                               |
| 4-PS3-2          | Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. |



## Fun with Energy

### ACTIVITY 1 - MAKE A VIDEO ABOUT ENERGY

Have students work in groups to make a video showing different kinds of energy using simple, everyday objects.

#### Examples

- Balls of different sizes can illustrate potential and kinetic energy.
- Musical instruments illustrate sound energy.
- A flashlight converts the electrical power of a battery to light energy.
- A food blender converts electrical energy to mechanical.

#### Ask & Discuss

Ask students to brainstorm and discuss their ideas before creating a video. The video can be used by students to introduce younger students to the topic of energy and how it can be changed from one form to another.

### DISCOVER THE ENERGY OF SOUND

Music is sound energy that transforms to mechanical energy.

### ACTIVITY 2 - MAKE SUGAR CRYSTALS DANCE

#### Process

1. Cover top of bowl with plastic wrap. Secure wrap with rubber band. Make sure that plastic wrap is taut.
2. Sprinkle small bit of colored sugar on the center of the wrap.
3. Have a student put her mouth close to the sugar and repeat the command "Dance" several times. The crystals should jump around.
4. Other students can repeat the action by humming, singing, changing from soft to loud, high to low notes.

### ACTIVITY 1 MATERIALS

Smartphone or video equipment



### ACTIVITY 2 MATERIALS

Bowl, plastic wrap to cover top of bowl, rubber band

Colored sugar crystals (see how to make them using gel coloring on YouTube at [www.youtube.com/watch?v=HENyoOVARao](http://www.youtube.com/watch?v=HENyoOVARao))



**Ask & Discuss**

- Why do the sugar crystals jump around?  
Answer: The sound is made by vibrations from the voice box in your throat. The vibrations cause sound waves to travel through the air. Sound waves can also travel through water, metal, and wood. The sound waves are a kind of energy that can move things, like the sugar crystals.
- Define “resonance”  
Answer: Resonance = vibrations caused by sound energy.

**Demonstrate**

Demonstrate resonance with a tuning fork, hitting a glass with a metal spoon, or clapping two wooden blocks together.

**Research**

Have student pairs or small groups find information on how categories of musical instruments make their sounds. Students can demonstrate how

- strings vibrate (violin, guitar);
- a reed vibrates (recorder, flute);
- metal vibrates (whistle, harmonica).

**HEAT ENERGY**

Remind students that heat energy causes matter to expand. Demonstrate the power of heat energy by constructing an erupting volcano. This is a favorite with kids.



**ACTIVITY 3 - CREATE A SAFE BUT IMPRESSIVE VOLCANO****Process**

1. Place the glass container in the center of the box. Add the water, vinegar, dish detergent and food coloring to the container.
2. DO NOT ADD BAKING SODA YET!
3. When you want the eruption to take place, place the baking soda inside a tissue. Roll up the tissue and drop into the container. The mixture of vinegar and baking soda will result in an eruption of colored "lava" flowing down the sides of the container.
4. Explain that the eruption is a result of the heat created by the mixing of vinegar and baking soda. This chemical reaction creates heat that makes the ingredients expand. The heat energy pushes the mixture out of the container and into the air.

**Research**

- Individuals, student pairs or small groups can research how an actual volcano is formed and how it erupts periodically because of heat energy. Students can present an oral report to the class, using visual aids of their own making.
- Read about how volcanoes may provide energy for the world of the future. Some helpful websites include:
- Geothermal Energy Facts" [www.sciencekids.co.nz/sciencefacts/energy/geothermalenergy.html](http://www.sciencekids.co.nz/sciencefacts/energy/geothermalenergy.html)
- Alliant Energy Kids: "Geothermal Energy" [www.alliantenergykids.com/energyandtheenvironment/renewableenergy/](http://www.alliantenergykids.com/energyandtheenvironment/renewableenergy/)

**ACTIVITY 3 MATERIALS**

- Sturdy cardboard or wooden box lined with newspaper
- Glass jar or other container
- ½ cup water
- ¼ cup vinegar
- ¼ cup dish detergent
- Red or orange food coloring
- 2 tablespoons baking soda
- Tissues



## ACTIVITIES FOR GRADES 4-5

## TRANSFER OF ENERGY

## Next Generation Science Standards

- PS3.B Conservation of Energy and Energy Transfer
- 4-PS3-2, 4-PS3-3 Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.

## ACTIVITY 1 - SOUND WAVES TRAVEL

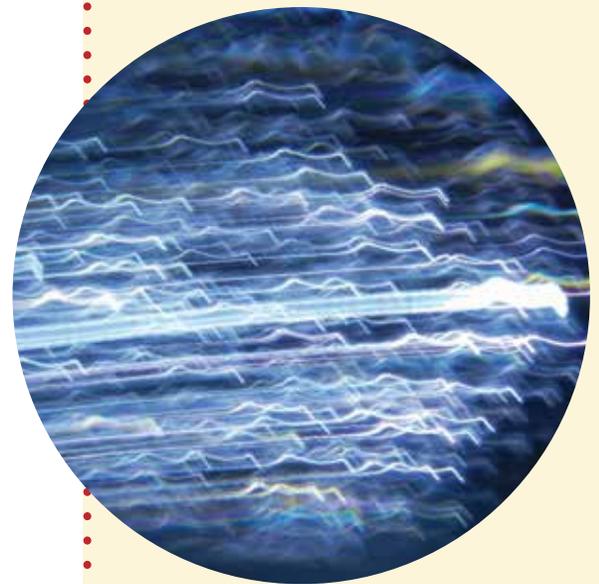
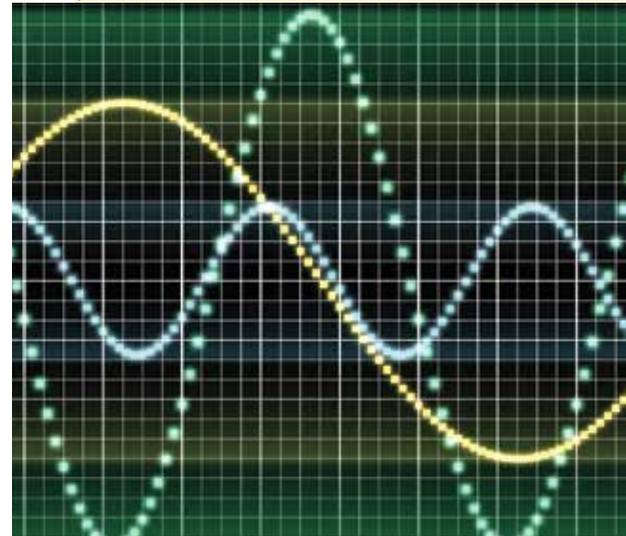
## Demonstrate

Have a student volunteer hold the glass of water. Then, strike the tuning fork and put it in the water as it vibrates. Students can see the sound waves travel through the water and create splashes.

## LIGHT ENERGY

## Next Generation Science Standards

- PS 4A Wave Properties
- 4-PS3-2 Light also transfers energy from place to place.



## ACTIVITY 2 - LET'S COOK IN A SOLAR OVEN!

Go to the following website for instructions on how to build an outdoor oven that cooks food using the power of the sun.

[www.alliantenergykids.com/wcm/groups/wcm\\_internet/@int/@aekids/documents/document/mdaw/mdi/~edisp/022819.pdf](http://www.alliantenergykids.com/wcm/groups/wcm_internet/@int/@aekids/documents/document/mdaw/mdi/~edisp/022819.pdf)

### Research

Read about how solar energy works. Go to Alliant Energy Kids: "Solar Power" [www.alliantenergykids.com/EnergyandTheEnvironment/RenewableEnergy/022400](http://www.alliantenergykids.com/EnergyandTheEnvironment/RenewableEnergy/022400)



## DIFFERENT WAYS TO MAKE ELECTRICAL ENERGY

### Next Generation Science Standards

4-PS3-2, 4-PS3-4 Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.

## ACTIVITY 3 - MAKE LIGHTNING

This experiment involves creating an electrical spark. It should be a teacher demonstration only. For directions, see [www.weatherwizkids.com/experiments-make-lightning.htm](http://www.weatherwizkids.com/experiments-make-lightning.htm)

### Ask & Discuss

- In a thunderstorm, how is lightning created? Describe how molecules become electrically charged. Answer: As rainwater evaporates, its molecules rise through the air. When the water molecules come in contact with air molecules, they exchange electrons. They become electrically charged (either positively or negatively). A



cloud is made up of drops of water. The cloud can build up a strong electrical charge. In time, the cloud cannot hold onto the electricity, which then forms lightning that crashes to the ground.)

- Why is lightning dangerous to people?  
Answer: Our bodies are good conductors of electricity. Electricity from lightning travels through a human body into the ground. People die or are injured by the electric charges.)
- What natural force causes lightning (and other objects) to fall to the ground?  
Answer: Gravity

#### ACTIVITY 4 HOW TO MAKE A HERO'S ENGINE

With your class, watch "An Easy Hero's Engine" presented by Bob Becker, *Flinn Scientific*, a video demonstration on YOUTUBE showing a simple way to build a Hero's engine. <http://www.youtube.com/watch?v=xKKCBzD7EQs> (runs 6.25 minutes)

This video is part of the *Flinn Scientific Best Practices for Teaching Chemistry Video Series*, a collection of over 125 hours of free professional development training for chemistry teachers - at [elearning.flinnsci.com](http://elearning.flinnsci.com)

**ATTENTION:** This demonstration is intended for and should only be performed by certified science instructors in a safe laboratory/classroom setting. (In other words, don't try this at home.)



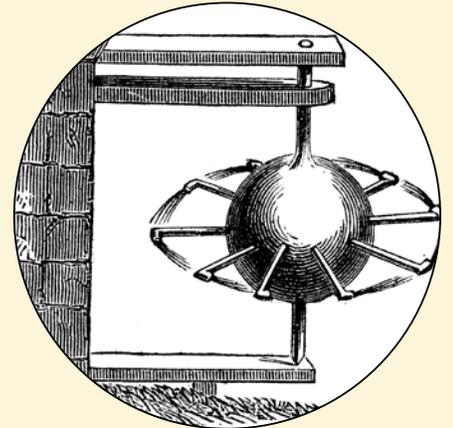
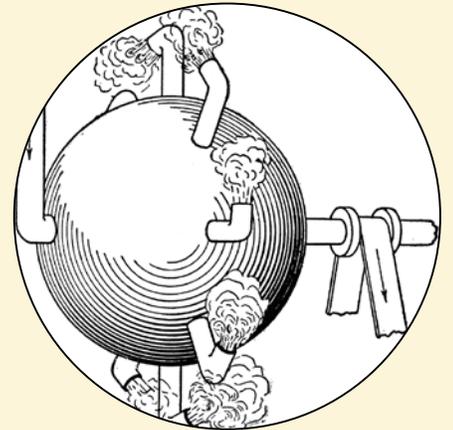
**A still photo from "An Easy Hero's Engine" presented by Bob Becker, Flinn Scientific.**

## Fun with Energy

### Ask & Discuss

On a second viewing of the video, the teacher may choose to stop the video at certain points to ask students to answer the following questions which include critical thinking skills. Remind students that the scientist is making a steam engine.

- Why did the scientist punch holes in the can instead of just opening the top to pour the soda out?  
Answer: He needs the holes to allow the steam to spin the can around and make a steam engine.
- Why does shaking the can make it quicker to empty out the soda?  
Answer: The shaking causes bubbles to form. They expand quickly and push the liquid that rests above the bubbles out of the can.
- Why does he only use a small amount of water to make steam?  
Answer: It takes less time and energy to boil less water.
- What might happen if he took the top off the can and just boiled water in it?  
Answer: The steam would rise into the air and not turn the can around.
- How does chemical energy from gas lines become thermal energy?  
Answer: The gas in the line is chemical energy. When the gas burns, it becomes thermal or heat energy.
- How did the heat energy become mechanical energy?  
Answer: Heat/thermal energy makes the water boil. Boiling water creates steam. Steam escaping the can makes it spin, creating mechanical energy.
- How could this mechanical energy become electrical energy?  
Answer: The spinning movement/energy can drive a generator which creates electrical energy.



**Old illustrations  
of Hero's Engines**

## TRANSFORMATION OF ENERGY PROJECTS

### ACTIVITY 5 - DIAGRAM A HERO'S ENGINE

Students can work in pairs or small groups to draw a diagram of how a Hero's engine (as shown in the video) changes chemical energy to thermal energy to mechanical energy (and electrical energy if they choose). The diagram can be used to create a poster or video explaining this process.

### ACTIVITY 6 - HOW DOES A STEAM TURBINE WORK?

Pairs or small groups can research how a steam turbine (rotating engine) works, draw diagrams, and present an oral report/ or video to the class.

### ACTIVITY 7 - HISTORY OF HERO

Pairs or small groups can research who Hero was and what he used his engine for. Tell students that his name is sometimes spelled "Heron" and that he lived in the city of Alexandria in the ancient Roman Empire. Have them create a booklet for the classroom library/or video on their findings.

### ACTIVITY 8 - LOCAL ENERGY SOURCES

Have students form teams. Have each team choose a research question, such as:

- Are fossil fuels are used in local power generation?
- Are other fuels, besides fossil fuels are used in local power generation?
- Are there energy conservation measures in place on a in your city or town and are renewable resources such as solar or wind energy projects generating energy in your area?

Each team can present their findings. Then have a class discussion and take a poll on which method the students think is the best way to generate energy.



**Examples of  
Local Energy Sources**