

WEEK OF RESOURCEFULNESS CLASSROOM ACTIVITY**TOPIC**

Harvesting Energy in Your School

KEY LEARNING OBJECTIVES

Students will be able to:

- **List** various types of energy that is used in a school, such as kinetic energy and thermal energy.
- **Design** a product that could be used to harvest wasted energy in a school building and convert it into something useful or increase energy efficiency.

OVERVIEW

In this activity, students will discover how high school science students used technology and innovation to harvest energy at their school from an act as simple as walking down the hallway. Students will be asked to think about their own school and identify ways that various types of energy, such as kinetic or heat energy, may be lost every day. They will brainstorm ideas for a product that could be used by students to capture this energy by doing something that they would normally do every day, such as sharpening their pencil or running around the gym. Students will work with a partner or small group to come up with an idea for an energy-harvesting product. They will create a sketch of how it will look and write a short description of how their product will work, and how the energy will be used that is harvested.

CONNECTION TO THE ENERGY-WATER NEXUS

- Energy harvesting is a process that captures small amounts of energy that would otherwise be lost as heat, light, sound, vibration or movement.
- Harnessing and redirecting harvested energy can improve efficiency of existing technology or lead to the innovation of new technology.

NATIONAL STANDARDS

Science

[Next Generation Science Standards](#)

[MS-PS1-6 Matter and its Interactions](#)

Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

[MS-ESS3-3 Earth and Human Activity](#)

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

[MS-ETS1-1 Engineering Design](#)

Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

BACKGROUND INFO

What types of energy are used in a typical school day? The answer to this question, it is MANY! There are various types of energy, such as thermal energy, electrical energy, and chemical energy that help you make it through a school day. However, not all of this energy is used, and the process of capturing wasted energy and putting it to use in a different way is called energy harvesting. Energy harvesting allows us to reduce and improve the ways in which we use energy, which can reduce both the financial and environmental costs of energy use.

KEY VOCABULARY

Kinetic energy

Thermal energy

Energy harvesting

MATERIALS

- Computer with internet access
- Student devices (tablet, laptop)
- Paper or poster board
- Writing utensils for sketching

PROCEDURE

1. Begin this activity by asking students how many types of energy they can identify and where each type comes from. The teacher can record and display student answers on the front board or overhead. Direct students to the **Resourcefulness: An Introduction to the Water-Energy Nexus app** <http://stem.guide/types-of-energy/> and ask them to read the information about the different types of energy—mechanical, thermal, electrical, radiant, chemical, and atomic energy. The teacher should ask students to share any additions or revisions that now need to be made to the list of energy types after reading about them on the Resourcefulness site.

2. Next, ask students to look around the classroom, or think about the school building and name some of the sources of each type of energy in the school. For example, students may identify that students running in the gym is kinetic energy, outlets in the classroom are sources of electrical energy, HVAC systems would be sources of thermal energy. These sources can be added under each type of energy on the front board or screen.
3. Explain to students that not all energy is used and that we can collect this wasted energy in a process called “energy harvesting,” that can use energy that would otherwise be lost to serve a new purpose. Show students a short video clip that shows how students at a high school wrote a grant that allowed them to install smart floor tiles in their school that generate electricity every time someone walks on them. <https://www.cbsnews.com/news/students-using-feet-to-power-their-high-school/>

Next, show a second video clip about how graduate students worked to create a way to harvest heat from a person’s breakfast on “smart furniture” that can be used to charge a cell phone.

<https://gizmodo.com/thermoelectric-ikea-furniture-could-harvest-energy-from-1744182176>

Using these examples of energy harvesting as a model, ask students to think of places that energy could be harvested in the school building.

4. Have students form small groups and explain to students that they will have the next 15 minutes to design a product that could be used by students to harvest energy from something that they would normally do every day, such as harvesting kinetic energy from opening and closing of a locker, or a way of harvesting heat from a laptop computer.
5. Students should spend time brainstorming ideas with their partner or small group and then write a short description of how their product will work—what type of energy will it harvest and what it will be called. They should also create a simple sketch of how it will look and work to harvest energy. Finally, they should include ideas about where the energy could go or be used for that will be collected from their product.
6. If time allows, student groups can take turns sharing their products with the class, showing and explaining their sketch of the product and explaining how it will work. They can receive feedback from other groups that could help them refine their product.

EXTENSION

An extension of this lesson could require students to create a prototype (non-working) 3-D model of their energy-harvesting design using simple materials. Students could then create and present a sales pitch for their product in a classroom “energy fair.”

SOURCES

<http://www.iop.org/resources/energy/index.html>

<https://www.cbsnews.com/news/students-using-feet-to-power-their-high-school/>

<https://gizmodo.com/thermoelectric-ikea-furniture-could-harvest-energy-from-1744182176>

<https://www.nationalgeographic.org/activity/energy-sources-and-energy-use/>

Resourcefulness App: stem.guide