

Classroom Energy Flow

Students create an energy flow diagram of their classroom by labeling and describing how objects in their classroom transfer energy.

Grade Level: K–4

Subject Areas: English
Language Arts, Science

Setting: Classroom

Time:

Preparation: 10 minutes

Activity: Two 50-minute periods

Vocabulary: Energy, Energy source, Heat, Light energy

Major Concept Areas:

- Energy flow in nonliving systems
- Energy flows in ecosystems, including human societies
- Definition of energy

Objective

Students will identify the flow of energy through various objects within their classroom.

Rationale

Students gain an awareness and appreciation of energy transfers in the classroom by examining how many school appliances and equipment use energy resources.

Materials

- Copies of *Energy Flow Arrows*
- Masking tape
- Writing paper or journals
- Writing implements
- Find additional resources related to this activity on keepprogram.org > Curriculum & Resources

Background

In the typical classroom, there are many examples of appliances and devices that use energy. Appliances change energy from one state, or form, to another (e.g., electrical to mechanical, or electrical to light). The energy source for most of these items is electricity. Schools usually get their electricity from a power plant. Power plants use a variety of energy resources to generate electricity, including fossil fuels (coal, oil, and natural gas), nuclear power, and renewable energy resources (biomass, hydropower, solar, and wind). Each of these resources (except for solar) is used to cause a turbine shaft to rotate. The rotating turbine shaft is connected to a generator containing a large wire coil. As the turbine shaft spins, it causes the generator's wire coil to turn. The spinning wire coil spins around large magnets, creating an electric current. Through this process, the generator converts the mechanical energy of the spinning turbine to electrical energy. The electric current produced by the generator in the power plant is then transmitted through power lines to homes and businesses in the surrounding community.

A simplified definition of an electric current is moving electrons. Electrons move because of the energy provided by a battery, a generator, or a similar source of electricity. Electrons flow through materials, such as copper wire, that will conduct them. Human beings can also conduct electricity, which is why it is extremely important to stay away from power lines and to avoid touching wires that are frayed or damaged. Contact

your local utility representative to learn other safety precautions.

When electricity reaches the school (or home or business) through the power lines, wires in the building carry the current through the school. Electrical sockets are ways to connect appliances to the electrical current supplied by the power plant.

Appliances are conversion devices that change energy from one state to another. For example, a light bulb changes electrical energy to light energy. Other appliances have motors that convert electricity to mechanical energy, such as in a blender or a fan in a SMART Board® projector. Other signs of energy observed in appliances include sound, light, movement, and heat.

Another major energy user in schools is the heating, ventilation, and cooling system (HVAC). The majority of schools in Wisconsin use furnaces or boilers that burn natural gas, fuel oil, or propane (also called liquid petroleum gas, or LPG). Biomass is used to heat some schools in northern Wisconsin and electric baseboard heat is used in some smaller schools.

Schools use large amounts of energy to light classrooms, run appliances, and maintain comfortable room temperatures. Next to personnel costs, energy expenses are usually a school's largest budget item. If schools spend less on energy, those funds will be available for other items students need.

Teachers and students can help reduce energy costs by turning off lights and appliances when they are not in use and encouraging the school to purchase energy-efficient items. Schools could save close to 30 percent of their energy expenditures through operational changes (such as energy-efficient lighting, insulation, and innovative HVAC systems).

The Focus on Energy Agriculture, Schools and Government Program is a comprehensive program that provides technical support and access to financing for schools interested in reducing their energy costs. For more information about this program, visit Focus on Energy at focusonenergy.com.

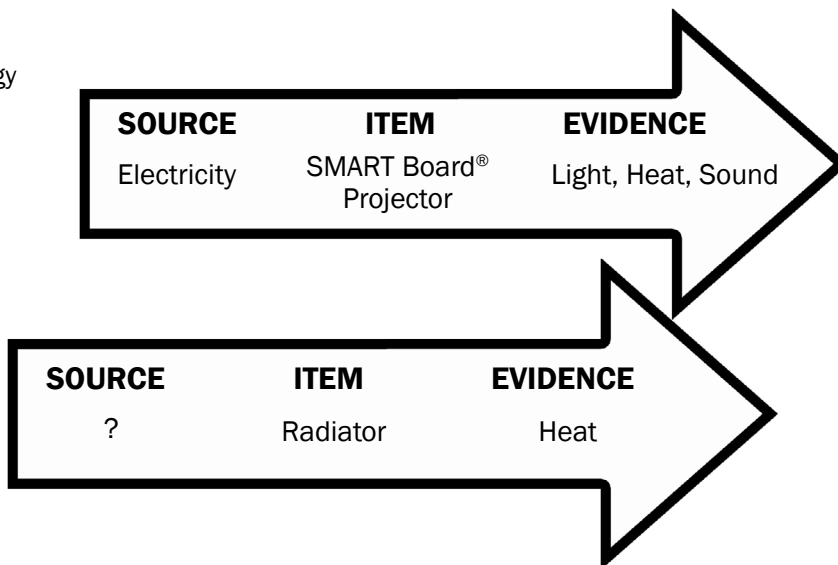
Procedure

Orientation

Review as necessary the evidence of energy in students' lives (movement, light, sound, and heat). Make sure students recognize common sources of energy (electricity, batteries, human effort, etc.).

Steps

1. Inform the class that they're going to make an energy map of the classroom.
2. Divide the class into small groups. Give each group an **Energy Flow Arrow**. Tell students they will be posting the arrows on items in the room that display evidence of energy.
3. Explain that the arrow has three parts. In the middle of the arrow, students will write or draw an item in the room. On the pointed end of the arrow, students should write or draw the evidence of energy the item displays. On the base of the arrow, students should write the source of energy for the item. Tell them to draw a question mark if they do not know the source.
4. Share the following two examples. In the first example, the SMART Board® projector emits light and gets its power from electricity. Students might also notice that the projector gives off heat and sound. Decide if you want to add that to the same arrow or use a separate arrow for each evidence of energy. In the second example, students might know that heat comes from a radiator, but they don't know what the energy source is (indicated by the question mark).



Common Classroom Energy Items

- Lights
- Appliances
- Computers
- Projector
- Radio
- Television
- Clocks
- Sinks (hot water)
- Furnace/Air conditioner vents
- Gas hookups in science laboratories

5. Ask each group to identify one item and make an arrow for it. If students have trouble finding items, refer them to the list of **Common Classroom Energy Items**. Hand out more arrows as needed until there are arrows over all appropriate energy items. NOTE: An alternative is to make a game out of the activity. For example, one group identifies an item and another group has to identify the energy form or the source or both.

Closure

After items in the room have been labeled, have the entire class share their labeled items and energy flows for the classroom. Work with students to fill in any blanks or clarify incorrect information. For example, if students do not know the source of heat for the radiator, whom could they contact to find out? They might want to invite the custodian or facility manager to explain or give them a tour of the heating and air conditioning system for the school.

Assessment Formative

- Were students able to identify appliances and equipment that use energy?
- Did students label the arrows correctly?
- How did students try to find out energy sources or transfers if they did not know the answer?

Summative

Use the **Energy Flow Arrows** to quiz students on how items in the room transfer energy by having students fill in blank sections of the arrow; this assessment can be in a game format like in the **Closure**. Have students refer to the arrows to make a map of the room in their journals and diagram the classroom energy flows (it might help to draw the map from a bird's-eye view).

Extension

Challenge students to trace the sources of energy further back. For example, they might have identified electricity as powering many items, but do they know where the electricity comes from? This activity would be a great opportunity to invite a representative from the community utility to present about electricity generation and energy resources, such as coal and nuclear. The representative can also share important electrical safety information.

Related KEEP Activities:

Have students participate in KEEP activities “Evidence of Energy” and “Where Does It Get Its Energy?” prior to this activity to help them recognize energy forms and sources.

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Energy Flow Arrows

The image contains three large, right-pointing arrows, each with a thick black outline. Each arrow is divided into three sections by vertical lines. The leftmost section is labeled 'SOURCE', the middle section is labeled 'ITEM', and the rightmost section is labeled 'EVIDENCE'. The arrows are stacked vertically, with the top arrow starting at a higher vertical level than the middle one, and the middle one starting higher than the bottom one. The entire diagram is enclosed in a blue rounded rectangular border.