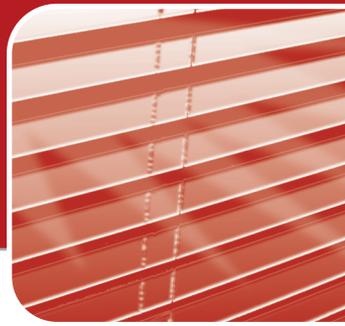


Summary: Students create posters that represent various light sources.

Light Savers



Grade Level: K–4

Subject Areas: Art, English Language Arts, Science

Setting: Classroom

Time:

Preparation: 30 minutes

Activity: two 50-minute periods

Vocabulary: Batteries, Electricity, Energy, Energy source, Non-renewable, Renewable

Major Concept Areas:

- Definition of energy
- Natural laws that govern energy
- Development of energy resources
- Management of energy resource use

Getting Ready:

Gather several magazines with images of different light sources that may be used to create posters (e.g., images of light bulbs, the sun, electronics that light up).

Related KEEP Activities:

Have students classify things they like to do under the source of energy it requires by conducting the activity “Where Does It Get Its Energy?”

Objectives

By the end of this activity, students will be able to:

- identify three sources of light;
- identify three items in their classroom that convert electricity to light;
- explain why it is important to have light in their classroom; and
- provide three alternatives for lighting, besides using lights that run on electricity, and advantages and disadvantages of each.

Rationale

It is important that students understand that light fixtures resemble the sun by providing artificial light in areas that may not have access to sunlight. Understanding the benefits of natural light is a valuable lesson for students to learn.

Materials

- Copies of the *Light Savers Activity Sheet*
- Poster paper
- Magazines for clipping pictures (or access to digital images)
- Scissors
- Glue
- Markers

Background

Have you ever been reading next to a window on a winter afternoon and realized at a certain point you had to turn the light on because you couldn't see what you were reading anymore? All of us have used natural sunlight to help us get things done, whether we realized it or not. The question is have we used this free, natural resource to its fullest potential?

We can use natural sunlight without harming the environment, but most other sources of light require energy that will have some impact on the environment (e.g., fire needs carbon, lights need electricity, flashlights need batteries).

Light is just one of the many forms of energy (radiant). A light wave consists of energy in the form of electric and magnetic fields. The fields vibrate at right angles to the direction of movement of the wave, and at right angles to each other. Because light has both electric and magnetic fields, it is also referred to as electromagnetic radiation.

Light can come from two types of sources, natural or human-made. Examples of natural light sources include the following: sun, lightning, glowing rocks (lava from volcanoes), and flames. Some plants and animals give off light called bioluminescence (glow worms and some deep sea fish).

Since it is not practical to rely on lightning, lava, or fireflies to provide light in our classrooms, we are left with only a few alternatives, sunlight, flames, or human-made light.



There are many sources of human-made light, including the following: candles, light bulbs, televisions, and fireworks. There are reasons that our modern schools do not use candles or lanterns to provide light in the classroom anymore. Safety issues and large numbers of students make those alternatives nearly impossible.

Since many of the human-made sources of light require electricity or batteries, it is important to understand how they differ. The main difference is that batteries can store energy and electricity can not

be stored. Electricity is generated and distributed through transmission wires. If electricity is needed by a customer to operate an appliance or turn on a light, it is there. However, it doesn't hang out and would not be available if the generation plant stopped sending it through the wires. That is why the electrical energy from lightning can not be harnessed and used at a later time. Batteries, on the other hand, can store chemical energy that can be used on demand.

There are advantages and disadvantages of using both electricity and batteries. Some advantages to using electricity include: it doesn't require a storage facility (or container) like a group of batteries. If the electricity is generated by using a renewable resource, there are no harmful emissions released into the atmosphere. Once the distribution lines are in place and there is a consistent energy source, electricity can be quite reliable. Some disadvantages to using electricity include the environmental impact of gathering the energy source needed for generation. See the **Energy Fact Sheets** on keepprogram.org > Curriculum & Resources > Energy Fact Sheets for more information.

Some advantages of using batteries include: items that use batteries are often very portable (they don't need to be plugged in), household batteries are generally easy to find, and small batteries are usually affordable. Some disadvantages include: they are sometimes hard to dispose of properly, they run out often unexpectedly, they need to be replaced when they run out, and large battery systems (that can power a house) are usually very expensive.

There is a chemical reaction that occurs in batteries that makes it possible to power appliances that provide light (e.g., lamp, television, computer). There are other chemical reactions that can result in light; some include the burning of carbon (fire), nuclear reactions, and bioluminescence.

Although there are many items in a classroom that provide light or light up, it is important to explain that the majority of these objects are considered energy conversion devices. They convert energy (electricity or chemical energy) into light; they are not an energy source. Refer to the activity "Where Does It Get Its Energy?" from the KEEP *Energy Education Activity Guide* to explore this concept.

An energy source is matter or a system from which one or more forms of energy can be obtained. For instance, natural gas is a source of thermal energy, and sugarcane is a source of chemical energy. On the other hand, an energy resource is an energy source that is used to meet the needs of a human society. Energy resources are subsets of energy sources.

Refer to the table **Energy Sources of Light** for a partial list of sources of light and their potential energy sources. You will find a column that identifies if the source of light is natural or human-made and several categories of energy sources (sun, electricity, and chemical reactions).

Sunlight is a vital source of light that humans depend on to survive. Studies have shown that the use of natural sunlight in the classroom improves the health (physical and mental) of both students and teachers, improves academic performance, and reduces behavior problems. By limiting the use of overhead fluorescent lights, not only does the school district save money on their electric bill, students and teachers reap the benefits mentioned above.

Many classrooms do not use natural sunlight to its fullest potential. Some ways to take advantage of sunlight include:

- Open window blinds when appropriate (if glare is a problem, maybe you can hang the blind lower on the window, allowing sunlight to enter the room near the top of the window, or adjust the blind to direct the light upward and



not directly into the room)

- Have class in a common space that has plenty of natural sunlight (cafeteria or lobby) if possible
- Hold class outside if appropriate

Since some classrooms do not have windows or there are times of the day when natural sunlight is inadequate for classroom lighting needs, overhead lights are there to supplement the sunlight.

Procedure

Orientation

Have you ever been somewhere when the lights went out? What did you do? Was it during the day or at night? Were you able to continue doing what you were doing before the lights went out? Why or why not?

Steps

Part 1

1. Ask students to generate a list of all the sources of light they can think of. These can be items that provide light or light

up. Suggest that they look around the room for ideas; imagine they are at home, or walking through a park. Write their answers on the whiteboard or on flip chart paper.

2. Explain that each item they listed has an energy source. Some items they listed will be energy conversion devices; others may be natural sources of light (see **Energy Sources of Light**).
3. Ask students how some of the items they listed light up or provide light. Do the items produce their own light or does it convert another form of energy into light?
4. Count the number of light sources listed and group students in pairs or teams of three. Assign a light source, from the list they generated, to each group and provide them with a **Light Savers Activity Sheet** (for teachers of younger students—you may decide to omit the **Light Savers Activity Sheet**—if so, go to Step 7.)
5. Work through the example on the **Light Savers Activity Sheet** together as a class.
6. Ask the groups to complete the second half of the activity sheet for a different light source.
7. Ask each group to create a poster of their light source (they can use drawings, magazine clippings, or digital images). They should also incorporate the answers from their activity sheet into the poster.
8. Hang the finished posters around the room and have each group present their answers.

Part 2

1. Invite a few students to help group

the posters of light sources found in the classroom together by energy source (i.e., place all electricity posters together and all batteries posters together).

2. Ask students which of these light sources are the most important, based on the information provided on the poster. Ask students why are they important?
3. Have them explain what happens when they turn the overhead lights on in their classroom (electricity travels through wires from the power plant to their school).
4. Ask them the following questions:
 - Why do we need overhead lights in their classroom?
 - What are the alternatives to turning on the lights in the classroom (e.g., opening up the window...light can get in).
 - Would any of these alternatives be practical?
 - Are there certain times of the day or year that these alternatives might be most practical?
 - Are there areas in your school that already use natural sunlight as a main lighting source?
 - Which areas?
 - What are the benefits of using natural sunlight in the classroom?

Closure

Ask students how they think they could use natural sunlight more?

Assessment

Formative

- Did students correctly answer the questions on the **Light Savers Activity Sheet**?
- Did students create posters that

illustrated their light source and the answers from their activity sheet?

- Did students clearly explain their posters to the class?
- Did students correctly identify which light sources are found in their classroom?
- Could students correctly identify which areas in their school use natural sunlight?

Summative

- Have students explain the advantages and disadvantages of using candles or flashlights in the classroom instead of turning on an overhead light.
- Ask students to explain how they could use more natural light at home.

Extensions

Have students describe how a typical school day would differ if there were no artificial lights in the entire school building, only natural sunlight.

Have students create a list of classroom activities that can be done using only a little natural sunlight, classroom activities that need a lot of natural sunlight, and classroom activities that require artificial light.

Have students use a light meter and the **Recommended Interior Light Levels in Schools** chart on page 76 to determine the light levels in their classroom and other areas of the school.

Have students complete a **Light Savers Activity Sheet** for a different light source at their home.

Energy Sources of Light

There are many different energy sources that provide light, including the sun, electricity, and various chemical reactions. Electricity can be generated using a number of resources, both renewable and non-renewable.

This table includes selected sources of light, whether they are natural or human-made, and their potential energy sources. Note that some sources of light have more than one potential energy source. NOTE: this is an incomplete list and it is advisable to add to the table as your students identify sources of light not listed here.

Energy Sources of Light

Source of Light	Natural (N) or Human- made (H)	Source			Chemical Reactions						
		Sun	Electricity	Battery	Carbon	Nuclear	Bioluminescence	Other			
Candle (flame)	H				X						
Cell phone screen	H		X	X							
Classroom overhead lights	H		X								
Clock	H		X	X							
Computer screen	H		X	X							
Desk lamp	H		X	X							
DVD player (screen or clock)	H		X	X							
Fire (flame)	N				X						
Fireflies	N								X		
Fireworks	H				X						
Flashlight	H			X							
Glow-in-the-dark paint	H										X
Hand held gaming device	H			X							
Indiglo® watch	H			X							

Light Savers Activity Sheet Example

Name _____ Date _____

Example

1. Source of light: **LCD Projector**
2. Is the item from number 1 found in your classroom? **Circle one:** **YES** **NO**
3. What is the energy source (what makes it light up)? **Electricity for the light bulb**
4. Is the energy source natural or human-made? **Human-made**
5. Can this energy source ever run out? **Circle one:** **YES** **NO** **I DON'T KNOW**
6. On a scale of 1–10, rate the importance of this light source with 1 being humans don't need it at all and 10 being humans couldn't live without it. Explain why.

1 **2** **3** **4** **5** **6** **7** **8** **9** **10**

Some people can use visualizers to put images on the front wall so they could do without an LCD projector. However, there may be some people that don't have access to a visualizer so they don't have that alternative.

Light Savers Activity Sheet

Name _____ Date _____

1. Source of light: _____

2. Is the item from number 1 found in your classroom? **Circle one:** YES NO

3. What is the energy source (what makes it light up)? _____

4. Is the energy source natural or human-made? _____

5. Can this energy source ever run out? **Circle one:** YES NO I DON'T KNOW

6. On a scale of 1–10, rate the importance of this light source with 1 being humans don't need it at all and 10 being humans couldn't live without it. Explain why.

1 2 3 4 5 6 7 8 9 10

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