



Would You Heat With Wood?

Objective

Students will be able to write and illustrate a story about burning wood for energy.

Background

Almost everyone has used wood to provide heat and light, whether it was a bonfire, a wood burning stove, or a fireplace in their home. While we often use fire because it is aesthetically pleasing, it also provides us with energy in the form of heat and light.

The uses of fire are varied depending on what apparatus the fire is burned in. When we use a bonfire, it is often for light when it is dark, to keep us warm, and to cook food to provide us with energy. Fireplaces are used to provide heat and to add a “glow” for ambiance. Wood burners and pellet stoves are two other examples of apparatuses that burn wood. A wood burner is often seen in residential homes, cabins, or hunting shacks. These can be used for heat and to cook on. Before homes had central heating systems, wood stoves were the primary place for heat for warmth and cooking. A pellet stove uses compressed pieces of leftover wood and paper products that are automatically fed into the apparatus.

Not only are the uses of the apparatuses different, but they also have different levels of efficiency. A campfire is the most inefficient method of burning wood because there is little control of the amount of air the fire receives. A fireplace can be controlled more, but can still be inefficient due to the air that comes in from the chimney into the open room. Wood stoves are more efficient than fireplaces because they are closed systems and the amount of air that gets into the system can be controlled by the operator. A pellet stove is the most efficient of the apparatuses mentioned for several reasons. Putting the fuel (wood pellets) into the stove does not require opening the door. (It can be manually or automatically fed so there is not energy lost from opening the door.) Like the wood burner, the operator has control

over the amount of oxygen the pellet stove receives. Most of the energy from a fire comes from burning, and the pellet stove takes advantage of this far more than the other apparatuses.

NOTE: Many manufacturers or companies that use wood products also use the wood by-products, such as sawdust and scraps, to provide heat and electrical energy for their facilities.

Procedure

Orientation

Tell students that they are going to be learning about energy that is made from a renewable resource—wood. Explain to students that renewable energy is energy that can be quickly replenished. Review the vocabulary words with the students and post them in the classroom.

Steps

Part I (Classroom or outside)

1. Show students a picture of a tree. Ask students what the picture is of. Show students a picture of a piece of wood. Ask them what the picture is of. After they have identified both, ask the students what the difference is between the two. Students should identify that one is alive and the other has been cut down or harvested.
2. Ask students why we harvest wood. If they have trouble identifying things made from wood, ask them to look around the classroom.
3. If they did not identify burning the wood as a reason for harvesting trees, show them a picture of a wood burner and/or a fireplace and ask the students if any of them have wood burners and/or fireplaces in their homes or cabins.
4. Ask students to raise their hands if they have ever sat by a fire before. Ask students if their families have rules for when they have a fire. If so, what are they NOTE: See sidebar on **Safety**.

Summary Part One:

Students write and illustrate a story about burning wood to demonstrate how energy comes from wood.

Grade Level: 3–5

Subject Areas: Art, Environmental Education Mathematics, Science

Setting: Classroom (possibly outside)

Time:

Preparation: 50 minutes

Activity: Two 50-minute periods

Vocabulary: Efficiency, Energy, Fuel, Harvest, Heat, Light, Light energy, Pellet stove, Renewable, Thermal energy, Wood, Wood burner

Academic Standards:

[Common Core Math:](#) MP6, 3.MD2,

[NGSS:](#) K-ESS3-3, 4-ESS3-1, 5-ESS3-1

SEP: Obtaining, Evaluating, and Communicating Information

DCI: ESS3.A: Natural Resources, ESS3.C: Human Impacts on Earth Systems

CCC: Cause and Effect, Systems and System Models

[WI Env Literacy & Sustainability:](#)

C1.A.i, EX2.A.e, EX2.A.i, EX4.A.i, EN6.A.e, EN6.A.i, EN6.B.e, EN7.A.e

Materials

- Book about wood burning (see **Getting Ready**)
- Log (optional)
- Pictures of tree, wood, fireplace, bonfire, wood burner, pellet stove
- Paper and art supplies
- Copies of **Efficiency Worksheet**
- Wood pellets (optional)

Continued next page

Summary Part Two:

Students review the efficiency of different wood-burning apparatuses.

Getting Ready:

Obtain one of the following books or a book of your choice.

- *Central Heating: Poems About Fire and Warmth*, Marilyn Singer
- *Safety Around Fire*, Lucia Raatma
- *Nature and Science of Fire*, Jane Burton, Kim Taylor
- *Science of Fire*, Rennay Craats

Related KEEP Activities:

Energy Divide” –KEEP Activity Guide. “Renewable Candy Resources” –Doable Renewables

Safety:

When operating any type of wood burning system, it is important to understand how to use the system safely. Children should never start fires unless it is a controlled area (fire ring, fireplace, wood burner) with an adult helping them. Fires are hot and should not be touched. All those near a fire should remain a safe distance from the flame. If you live in a home with a fireplace or a wood burning stove, it is important to clean the system, which includes the chimney and stovepipe, and also to set up your system safely, which involves proper floor and wall protection and proper clearance.

5. Hold up the picture of the bonfire and ask students what the picture is of. Tell them what that kind of fire is used for (see **Background**) and what the pros and cons are for this system.
6. Repeat Step 5 for fireplaces, wood stoves, and pellet stoves.
7. Tell students that they are going to write a story about burning wood.
8. Provide students with paper and art supplies so they can write and draw the pictures for their story. (Students who are too young to write the story may draw pictures of how they have used fire.)
9. When the stories are finished, let the class share their stories with each other.

Steps

Part II

1. Explain to students what the definition of energy is and discuss energy efficiency. Efficiency is accomplishing a task with a minimum of effort and waste. The different kinds of fires the class discussed in part one all have different levels of efficiency.
2. Explain to students that when a fire is efficient, there is not a lot of ash or smoke. Ash and smoke are waste products that show that all of the energy in the wood or wood pellet was used up.
3. Work with the students to identify how much ash and smoke are produced by a bonfire, fireplace, wood burner, and pellet stove. See **Background** and **Resources**. Draw on student experiences and insert any missing information. Tell students that the fire burning methods that are exposed to more air are usually less efficient and the ones that are more controlled (air and source of fuel) are usually more efficient.

Closure

Provide each student with the **Efficiency Worksheet**. Students should draw a face in the circle next to the picture to show whether

it is efficient (smile) or not efficient (frown). Review the answers with the students.

KEY: Most efficient to least efficient: pellet stove, wood burner, fireplace, bonfire.

Assessment

Formative

- Did students’ stories and pictures show evidence of energy, i.e. heat and light?
- Were students able to match the pictures?

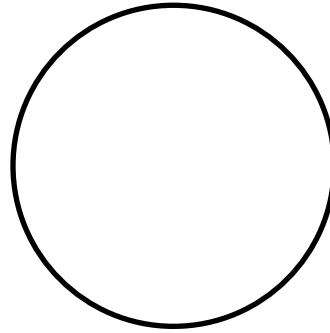
Summative

Experiment with various ways to create and contain fires. For example, bonfire, fireplace, wood stove, pellet stove. Create tin can replicas. Obtain four metal cans. Leave one can as it is and use a nail and hammer to poke a different amount of holes in the remaining cans. Collect small pieces of wood and burn it in each of the cans. Consider obtaining a piece of metal to use as a lid as well (remember to use a pot holder or insulated gloves). Have students predict which can will burn most efficiently. Observe and record how much ash and smoke was given off by each can. The amount of ash in each can should be weighed. This measurement will provide the evidence necessary to determine which can was most efficient. Have students align their can model with a real life wood burner to declare best efficiency.



Efficiency Worksheet

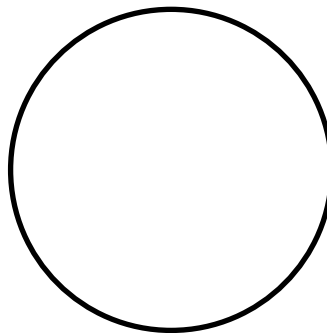
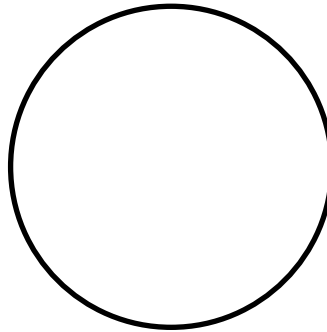
Instructions: You are going to draw a face in the circle next to the picture to show whether it is efficient (smile) or not efficient (frown). Each face should be different based on how efficient the item in the picture is.



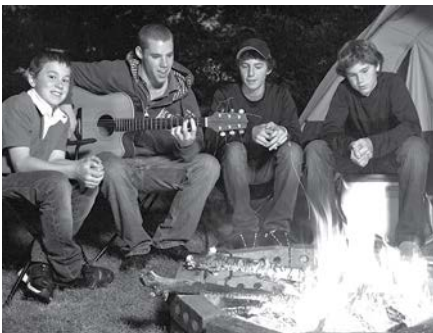
Wood Burner



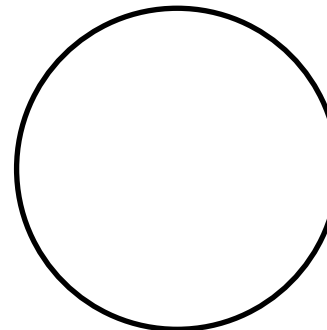
Pellet Stove



Fireplace



Bonfire





Pellet Stove





Fireplace





Bonfire





Wood Burner

