



# TEACHER INFO

## ENERGY TRANSFER

### GRADES 3-5

#### COMMON MISCONCEPTIONS

- **Energy is matter.**  
Students may think that matter (things like coal, wood, etc.) are energy. Energy is stored in coal and wood, but the materials themselves are forms of matter, not energy. When coal or wood is burned, the chemical energy stored within is released as heat and light—this shows energy being transferred, not existing as matter.
- **Objects must be in contact with one another in order for energy to be transferred.**  
Energy, like light and sound, can move through the air. Energy can be transferred without direct contact through radiation (like sunlight warming your skin) or through sound waves. Emphasize that energy moves through solids, liquids, gases, and even empty space in different ways.
- **Only hot or warm objects transfer energy.**  
Moving objects can transfer energy regardless of their temperature. A baseball thrown through the air transfers motion energy when it hits a bat or a glove. Energy transfer isn't limited to temperature changes—it also happens through motion and collisions.
- **The motion energy of an object does not depend on its speed.**  
The motion energy of an object increases as the speed increases. The faster something moves, the more kinetic (motion) energy it has. For example, a fast-rolling soccer ball is harder to stop than a slow-moving one because it has more energy.
- **Energy is associated mainly with humans, not inanimate objects.**  
Inanimate objects have energy if they are moving. For example, water flowing in a stream due to gravity has energy. Students often think energy comes only from people doing things, but many natural processes involve energy transfer without human involvement. Wind, waves, and falling rocks all transfer energy without human action.
- **An object has energy within it that is used up as the object moves.**  
Energy is transferred between objects and as heat and light but is not used up. Energy changes form or moves to different places—it doesn't disappear. For instance, when a moving swing slows down, its energy is transferred to the air and friction as heat and sound, not lost entirely.



## WHAT IS ENERGY?

At this level, energy can be defined as the ability to get things done. Students should understand that energy is not “stuff”—it cannot be held in their hand nor does it have any weight. In later grades students will explore energy and energy transfer in more depth and quantitatively.

## ENERGY VS. ELECTRICITY

When we talk about energy, we often talk about motion energy, sound energy, heat energy, or electrical energy. However, these are not all different types of energy—these words define where the energy is and how it is moving from place to place. When a lamp is plugged into an outlet the energy that flows through the electrical wires to the light bulb, where it is transformed into light, is all the same energy, but we might say that it is electrical energy transformed into light energy.

## GENERATORS

A generator is simple machine that converts, or transforms, motion energy into electrical energy. The word “generator” can be misleading since energy is being transformed, not generated or created. Inside Dr. Jeff’s bicycle generator, the wheel is spinning because of the motion energy from Dr. Jeff’s mom pedaling. The generator doesn’t generate the electricity that powers Bert, it converts the motion energy to electrical energy.

## SEMANTICS OF THERMODYNAMICS

The first law of thermodynamics, or the law of conservation of energy, says that energy can neither be created nor destroyed. Yet, we often discuss “producing” and “using” energy when energy is actually being moved (transferred) from place to place, or converted or transformed, from one form to another. Choose your words carefully when working with students and discussing energy to avoid student misconceptions.

