



# ENERGY TRANSFORMATIONS

## Grade 4 Lesson Plan

### OVERVIEW

Students will rotate through eight stations, exploring how toys create energy transformations. They discuss which energy forms are involved, then create equations to represent the energy inputs and the energy outputs. Students are introduced to some of the many engineering and geoscience careers that involve the production, transmission, application, and conservation of energy.

### CURRICULUM TIES

AREA	CURRICULUM LINKS
Science	Energy can be transformed
	What is energy input and output?

### MATERIALS LIST

- 8 different types of toys
  - Have a variety of toys that illustrate different kinds of energy:
    - Wind up car, flashlight, slinky, balsa wood airplane, electric buzzer, etc.
- *Energy Form Words and Math Symbols* Printable Templates
  - Each station will need 3 of each Energy Form words, 5 “+” signs and 2 arrows.
- Pocket chart, magnetic surface with chart paper or white board.
- Video or photo device and computer projector.
- *Energy Transformations* Printout.
- *Careers* PowerPoint Slides.

## ACTIVITY TIMELINE

SECTION	APPROXIMATE TIME
Introduction	20 minutes
Stations	35 minutes
Reflections	15 minutes
Careers PowerPoint	10 minutes
Wrap Up	5 minutes

**\*Please note:** Educators can modify the time in each section to best suit their students' needs.

### INTRODUCTION

1. Ask the students where they have seen energy used in their home, at school or in their community. Some question prompts you could use are:
  - 1.1. Where can we find energy in the community?
  - 1.2. What uses energy in the school?
  - 1.3. What happens when energy is used?
 Add students' responses to a chart or web so that ideas can be expanded upon in future lessons.

### STATIONS

1. Review station expectations with the students. These should include:
  - 1.1. Students take turns using the toys a few times, then discuss ideas before creating equations.
  - 1.2. Once the equation is created retest the toy to see if the equation is correct.
  - 1.3. Student move onto the next station in 3–4-minute intervals.
2. At the end, ask if anyone would like to demonstrate a toy then explain their equation.

### REFLECTIONS

1. Students use the *Energy Transformation* Printout or a journal to draw four toys and their equations.
2. Have them share their work with a partner and emphasize where the transformations occurred.

## SLIDE SHOW

1. View the PowerPoint slides. They illustrate a variety of engineering and geoscience careers related to energy production, transmission, applications, and conservation.
2. Have students point-out where they see the forms or transformations of energy in the pictures.

## WRAP UP

- 1) Reinforce that transformations are happening all around us and that there are many jobs/careers focused on energy.
- 2) Have students challenge their parents to name various energy forms and transformations in their homes or communities.

## EVALUATION

- The Curricular Competencies in this activity could be used as evidence students select for a Core Competency self-assessment.
- The students' illustrations should show energy forms as the toy works. The arrows indicate the energy input and output (before and after).
- Take photos/video of the stations to document students-in-action.

## EDUCATOR INSTRUCTIONS

The *Energy Transformation* printout provides an opportunity for students to represent their understanding. Have them add labels to identify the forms of energy and where the transformations are occurring.

If students are not already familiar with energy put the 10 forms into a pocket chart or on a white board. Demonstrate a toy not being used in the stations. Ask the class what energy forms they notice. Create an energy equation using the "+" signs on either side of the arrows. For example, lifting a ball then letting go, watching it bounce would be as follows:

mechanical + gravitational  $\rightarrow$  mechanical + elastic + sound

The arrow indicates the direction of transformations as the toy works. It is not important that the students are exact or have the forms in the right order (i.e., the above example could also start with gravitational + mechanical. The focus is on how energy transforms (changes) into different forms.

## AT WORK IN YOUR COMMUNITY

This section contains useful information for Educators to communicate about engineering careers, relating to this activity.

Engineers make a difference. They use their imagination, creativity, and expertise every day to solve problems and improve the world we live in. They work with people like architects and doctors to make the world better and help people live healthier and safer lives. There are many different types of engineers at work in our community.

There are two types of engineers that have a lot to do with energy transformations:

**Mechanical Engineers:** Design and create things that move. As a mechanical engineer, you could design everything from a child's toy to a life-saving medical device like a pacemaker.

**Electrical Engineers:** Design systems that bring electricity to homes and buildings. They need to make sure that everything is done safely and meets people's needs. Electrical engineers develop components for some of the most critical things in our lives like life support systems in hospitals, airbags in vehicles, and communication systems.

## MODIFY/EXTEND THIS ACTIVITY

- Some students will have a deep knowledge of energy forms. They understand that food energy powers our motions; that anytime we move our arms mechanical energy is created from the chemicals inside our bodies. This could be included in the equations.
- Students can glue the station words onto their drawings, instead of printing.
- Have students bring toys from home and set-up a buddy sharing session with a younger class.
- Have students create a Rube Goldberg machine. This strongly supports energy transformations and is a very engaging ADST activity:
  - [Rube Goldberg Institute | Home - Rube Goldberg Institute](#)
  - <https://blog.connectionsacademy.com/build-your-own-rube-goldberg-machine/>
  - <https://www.youtube.com/watch?v=6FzUx2EFk8s>

## RESOURCES

Interested in learning more? Check out these resources.

- [Engineers and Geoscientists BC Website](#)
- [Hydroelectricity in BC](#)
- [What is energy – lesson for kids](#)
- [Bill Nye the Science Guy's Energy video](#)
- [Twig World](#)