

Energy, Forces and Motion: A 2-Day STEM 5th-Grade 5E Lesson Plan

Overview

This lesson plan is designed to engage students in exploring the concepts of energy, forces and motion through hands-on activities, demonstrations, experiments and discussions. The lesson follows the 5E model of instruction: Engage, Explore, Explain, Elaborate and Evaluate. The lesson is aligned with the Next Generation Science Standards (NGSS) and the Common Core State Standards (CCSS) for literacy and math. The lesson can be divided into two days, with three activities each day.

Day 1	Day 2
Activity 1: Energy Ball (Engage)	Activity 4: Roller Coaster (Elaborate)
Activity 2: Force and Motion Stations (Explore)	Activity 5: Balloon Rockets (Elaborate)
Activity 3: Energy Transfer Experiment (Explain)	Activity 6: Energy Quiz (Evaluate)

Standards

NGSS	CCSS Literacy	CCSS Math
5-PS2-1: Support an argument that the gravitational force exerted by Earth on objects is directed down.	RI.5.1: Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.	5.MD.A.1: Convert among different-sized standard measurement units within a given measurement system.
5-PS3-1: Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.	RI.5.3: Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.	5.MD.B.2: Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Use operations on fractions for this grade to solve problems involving information presented in line plots.
5-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.	W.5.1: Write opinion pieces on topics or texts, supporting a point of view with reasons and information.	5.G.A.1: Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a

given point in the plane located by using an ordered pair of numbers, called its coordinates.

Student Learning Objectives

- Students will be able to define energy, force and motion and give examples of each.
- Students will be able to explain how energy can be transferred from one object to another by sound, light, heat and electric currents.
- Students will be able to demonstrate how forces can affect the motion of objects.
- Students will be able to design and conduct experiments to test their hypotheses about energy, forces and motion.
- Students will be able to use data, evidence and reasoning to support their arguments and claims about energy, forces and motion.
- Students will be able to apply their knowledge of energy, forces and motion to real-world situations and problems.

Activities

Day 1

Activity 1: Energy Ball (Engage)

Objective	To spark students' curiosity and interest in energy, forces and motion by using an energy ball to demonstrate how energy can be transferred by electric currents.
Materials	An energy ball (a small plastic ball that lights up and makes noise when two metal strips on opposite sides are touched), a timer, a chart paper, a marker.
Time	15 minutes

Activity 2: Force and Motion Stations (Explore)

Objective	To provide students with opportunities to explore how forces can affect the motion of objects by rotating through four stations: ramp, pendulum, magnet and spring.
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Materials	For each station: a station card with instructions and questions, a ramp, a toy car, a stopwatch, a meter stick, a pendulum, a protractor, a magnet, a paper clip, a spring, a marble, a plastic cup, a data sheet, a pencil.
Time	40 minutes (10 minutes per station)

Activity 3: Energy Transfer Experiment (Explain)

Objective	To help students explain how energy can be transferred from one object to another by sound, light, heat and electric currents by conducting an experiment with a solar panel, a light bulb, a speaker and a fan.
Materials	A solar panel, a light bulb, a speaker, a fan, a battery, wires, alligator clips, a flashlight, a radio, a thermometer, a data sheet, a pencil.
Time	30 minutes

Day 2

Activity 4: Roller Coaster (Elaborate)

Objective	To extend students' understanding of energy, forces and motion by designing and building a roller coaster model that demonstrates the conservation of energy and the effects of gravity and friction.
Materials	Cardboard, paper, tape, scissors, glue, foam tubing, marbles, a ruler, a stopwatch, a data sheet, a pencil.
Time	45 minutes

Activity 5: Balloon Rockets (Elaborate)

Objective	To extend students' understanding of energy, forces and motion by designing and launching balloon rockets that demonstrate Newton's
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	third law of motion and the relationship between force, mass and acceleration.
Materials	Balloons, string, straws, tape, scissors, a meter stick, a stopwatch, a data sheet, a pencil.
Time	30 minutes

Activity 6: Energy Quiz (Evaluate)

Objective	To assess students' understanding of energy, forces and motion by giving them a quiz that covers the main concepts and skills from the lesson.
Materials	A quiz sheet, a pencil.
Time	15 minutes

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