

Energy Learning Progression Map

| Aspect | 3 rd Grade: Energy and Motion | 4 th Grade: Energy in Everyday Devices | 5 th Grade: Food, Fuel and Heat |
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| Nature/ Manifestations (“Forms”) of Energy | Energy of motion and stored energy in batteries, springs and elastics. Batteries, springs, elastics have energy because they can cause motion. Indicators (e.g. speed, deformation) as rough measures of amount. | Stored gravitational energy is a property of object/earth system, not just object. Light and sound as carriers of energy. Energy is not matter – energy can transfer even when matter does not. | Thermal energy is a form of energy. No such thing as “cold energy”. Food and fuels release stored energy when they combine with oxygen. Sunlight as energy source for organisms, weather, food, etc. |
| Transfers and Transformations | Energy gains/losses in combination. Gains and losses described as “giving to” or “sharing with.” In some transfers form also changes. Introduce “system” for group of interacting objects. | Gains/losses correlated in amount (less/more – not quantitative). More than one form of energy, change of form within single object/system. Choice of system can depend on context. | Thermal energy flows from hotter to cooler objects. Other forms transform into thermal. Thermal energy can transform into other forms, but not completely. Applications to real-world phenomena. |
| Dissipation/ Degradation | Students speculate about “Where does the energy go?” when the phenomenon stops. | Sound, light, heat can remove energy from the system. “Lost” energy cannot be fully recovered. | Large system may absorb thermal energy without becoming noticeably hotter. Apparently “lost” energy could be thermal energy in the environment. Closed vs. open systems. |
| Conservation | Must have energy to give energy. Students learn to ask “Where does the energy come from?” | Trace energy flow in simple devices, using pencil & paper and concrete representations. Amount of available energy limits what device can do. | Trace energy flow in diverse real-world systems, including chemical & biological, with environment. Draw inferences, make predictions using energy arguments. |
| Prototypical Activities | Collisions. Balls, springs, elastics. Propeller (battery, rubber band) All phenomena in horizontal plane. | Simple circuits, capacitor, solar cell. Balls, carts & ramps, pendulum. Magnets Phenomena including height changes. | Hot object in cold water. Chemical hand warmers. Smashing steel spheres burn paper. Fan in insulated box – temp. increase. |
| Connections to Matter Curriculum | Practices: Asking questions; Carrying out investigations; Developing and using models; Arguing from evidence; Obtaining evaluating, communicating information. | Similarities/differences between energy and matter. Divisibility – energy can be “divided up” like matter, but it doesn’t go away. Concept of a system. | Closed vs. open systems. Flow, transfer, transformation. Thermal energy as random kinetic energy – particulate model. Energy in gas expansion, evaporation. |