

Enduring Understandings

STC/MS Energy, Machines, & Motion

ENDURING UNDERSTANDINGS	CONCEPTS: <ul style="list-style-type: none"> • Energy is the ability to do work. • Energy appears in different forms. It can be transferred and sometimes transformed. • Energy cannot be created or destroyed, only changed from one form to another. • Energy is not matter but can be stored in matter. It can pass through matter. It can move matter. • Force is a push or pull between two objects that causes an object to stretch, bend or change motion. • Motion is a change in position over time. • Changes in motion (direction and/or speed) are dependent on unbalanced forces. 		
	Sources of energy:	Transfer or transformation of energy:	Resulting changes in matter:

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SCIENCE AS A WAY OF KNOWING:

- Inferring energy transfer and transformation, through generation and analysis of data collected in various systems.

CONCEPTS:

- Types of energy are chemical, mechanical (potential and kinetic), and electromagnetic (electrical, light and thermal)
- Energy in the form of heat is almost always one of the products of an energy transformation
- Three types of forces are tension, gravitational, and friction.
- Work is anything that causes a change in an object or system through the application of a force.
- Machines make work easier by reducing the force needed but increasing the distance.
- Speed is distance traveled in a given unit of time.
Speed = distance/time
- Weight is defined by gravity's effect on mass.
(Newtons vs. grams)

LAB SKILLS:

- Recognize inference vs. observation
- Use units of measurement appropriately
- Practice accuracy
- Measure forces using a spring scale
- Use graphs to make predictions (extrapolation)

INQUIRY SKILLS:

- State an appropriate question
- Generate materials and logical procedures
- Use an appropriate control
- Control all variables except the manipulated variable
- Include an appropriate number of replicates
- Construct an appropriate data table
- Collect and record data completely
- Use a table and graph to display data
- Use evidence from your data to support logical conclusions
- Chart the flow of energy in an everyday object based on evidence

LIFE SKILLS:

- Gain confidence as scientists

FAMILIAR WITH WORTH BEING

CONCEPTS:

- Potential energy is stored energy that has the potential to do work. Potential energy can take various forms such as chemical potential energy, spring (elastic) potential energy, etc.
- The potential energy of an object depends on its position.
- Kinetic energy is the energy of motion.
- Kinetic energy depends on speed.
- Gravitational force is the force of attraction between two bodies. The greater the masses of the two bodies, the greater the gravitational force between them.
- Elastic force is the force associated with stretchy materials.
- Friction is the force that resists motion between two surfaces in contact with one another.
- Work = force x distance. The metric unit for work is the Newton-meter or **joule**.
- Power is measure of the work done in a given unit of time.
Power = work/time. Power is measured in **watts**.
- Simple machines are ramps, pulleys and levers.
- The actual mechanical advantage of a machine is the ratio of load force to effort force.
- Efficiency is defined as the ratio of work output to work input.
- Motion is influenced by the size and duration of the force.
- Average speed is calculated by dividing the distance an object travels by the time it takes to travel that distance.
- Acceleration is a change in speed. An object that is speeding up or slowing down is accelerating.

