

# Science: Sixth Grade

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In sixth grade science, students learn about the basics in Physical, Earth, and Life Science. Topics of study include Scientific method, atoms, elements, forces and motion, simple machines types of energy and transformations, weather and water, and diversity of life.

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## *Course Information:*

**Frequency & Duration:** 43 minutes; 5 periods per week; full year

**Text:** 6<sup>th</sup> – 8<sup>th</sup> grade supplemental, Harcourt Science

## **Asset Modules:**

Variable

**Content:** Scientific Method

**Duration:** August/September (3 weeks)

<b>Essential Question:</b>	How do people solve problems? How do we find answers with scientifically reliable method? What makes a question testable?
<b>Skill:</b>	<ul style="list-style-type: none"> <li>Identify the parts of the scientific methods and use a lab sheet.</li> <li>Infer and predict as part of completing a lab activity.</li> <li>Draw conclusions as part of completing a lab activity.</li> <li>Graph results of a lab activity.</li> </ul>
<b>Activities</b>	<ul style="list-style-type: none"> <li>Skittle Lab</li> <li>Swinger Lab</li> <li>Pumpkin Lab (October)</li> </ul>
<b>Assessment:</b>	<ul style="list-style-type: none"> <li>Students will be able to identify and apply the scientific method as part of a lab investigation.</li> <li>Students will identify key vocabulary as part of an assessment.</li> </ul>
<b>Resources:</b>	Science Harcourt Student Edition pg. 2-15 Foss Swinger Lab Foss Science Stories Variables p. 1-7 Graph sheets
<b>Standards:</b>	3.2.6.B7.Science as Inquiry
<b>Vocabulary:</b>	<p><b>Analyze-</b> to study something closely and carefully; <b>Communicating-</b> the process of sharing ideas with others through writing and speaking; <b>Controlled Experiment-</b> an experiment in which only one variable is manipulated at a time; <b>Conclusion-</b> an opinion or decision that is formed after a period of thought or research; <b>Conduct-</b> the process of working through an experiment; <b>Cycle-</b> is any motion or activity that repeats itself; <b>Coordinate plane-</b> a plane spanned by the x-axis and y-axis in which the coordinates of a point are in distances from two intersecting perpendicular line; <b>Data-</b> facts, figures, and other evidence that scientists collect through observing; <b>Dependent Variable or Responding Variable-</b> the factor that changes as</p>

a result of changes to the manipulated, or independent, variable in an experiment; **Hypothesis**- a possible explanation for a set of observations or answer to a scientific question; **Inferring**- the process of making an inference, an interpretation based on observations and prior knowledge; **Independent Variable or Manipulated Variable**- the one factor that a scientist changes during an experiment; **Observation**- the act of paying close attention to someone or something in order to get information; **Qualitative Observation**-an observation that deals with characteristics that are not expressed numbers; **Quantitative Observation**-an observation that deals with a number or amount; **Pendulum**- a mass hanging from a fixed point that is free to swing to and fro; **Problem**- a question raised for inquiry, consideration or solution; **Predicting**- the process of forecasting what will happen in the future based on past experience or evidence; **Research**- careful study that is done to find and report new knowledge about something; **Science**- a way of learning about the natural world through observations and logical reasoning leads to a body of knowledge; **Scientific Inquiry or Scientific Method**- the ongoing process of discovery in science; **Scientific Theory**- a single explanation that connects a large set of related observations or results from experiments; **Standard**- is the basic procedure used in a controlled experiment, before changing any of the variable; **System**- a group of related parts that move or work together; **Variable**- a factor that can change in an experiment; **X-axis**- the horizontal line that represents the independent variable; **Y-axis**- the vertical line that represents that dependent variable

### Comments

**Content:** Atoms/Matter

**Duration:** September/October (3 weeks)

<b>Essential Question:</b>	<ul style="list-style-type: none"> <li>• What are atoms made of?</li> <li>• How do atoms differ?</li> <li>• How is matter different and the same?</li> </ul>
<b>Skill:</b>	<ul style="list-style-type: none"> <li>• Distinguish the difference in properties of solid, liquid, and gasses.</li> <li>• Identify the difference of volume and mass</li> <li>• Identify the subatomic particles and charges of atoms</li> <li>• Differentiate between atomic number and atomic mass</li> <li>• Explain the electromagnetic force</li> <li>• Identify how energy is transferred</li> </ul>
<b>Activities</b>	<ul style="list-style-type: none"> <li>• Demonstration of Empty Space</li> <li>• Hole-y Water</li> <li>• Nuts and Bolts of Chemistry</li> </ul>
<b>Assessment:</b>	<ul style="list-style-type: none"> <li>• Students will explain how the properties of matter change during energy transfer.</li> <li>• Using models, the students will construct atoms.</li> </ul>
<b>Resources:</b>	<ul style="list-style-type: none"> <li>• Bill Nye Science Video Atom</li> <li>• Bill Nye Science Video Matter</li> <li>• Mark Twain- Atoms: Building Block of Nature</li> <li>• Bill Nye the Science Guy: Teacher Guide</li> </ul>
<b>Standards:</b>	<p>3.2.6. A1. Distinguish the differences in properties of solids, liquids, and gases. Differentiate between volume and mass. Investigate that equal volumes of different substances usually have different masses.</p> <p>3.2.7. A3. Explain how energy transfer can affect the chemical and physical properties of matter.</p>
<b>Vocabulary:</b>	<p><b>Atomic Number-</b> the number of protons in an atom; <b>Boiling point-</b> the temperature at which a substance changes from a liquid to gas; <b>Chemical Reaction-</b> a substance produced in a chemical reaction; <b>Compressed-</b> the physical appearance of a sample of matter based on the kinetic energy of its particles. Common phases include solid, liquid, and gas; <b>Density-</b> the smallest piece of a substance that is still that substance; <b>Dissolve-</b> two or more substances together; <b>Electron-</b> a phase of matter that has definite volume but no definite shape. Particles of liquid are loosely bonded, but can flow over and around one another; <b>Element-</b> a</p>

substances made up of only one kind of atom; **Expansion**- a phase of matter that has no definite shape or volume. Particles of gas fly independently through space; **Gas**- an increase of volume; **Matter**- anything that has mass and takes up space; **Mass**- a subatomic particle with a positive charge; **Mixture**- to incorporate one substance uniformly into another substance at the particle level; **Melting Point**- the temperature at which a substance changes from a solid to a liquid; **Neutron**- a way to organize the elements based on atomic number and chemical property; **Nucleus**- the center of an atom, usually made of protons and neutrons; **Particle**- the ratio of mass and volume in a sample of matter; **Periodic Table of Element**- a characteristic of a substance that can be observed without changing it chemically, such as size, shape, density, and phase; **Phase**-reduced in volume as a result of applied pressure; **Physical Property**- a type of matter defined by a unique particle; **Plasma**- a state of matter made up of charge atoms, uncharged atoms, and free electrons; **Proton**- a mixture formed when one substance dissolves in another; **Reactant**- a defined quantity of space; **Solid**-a subatomic particle with no charge; **Soluble**- a measure of the quantity of matter; **Solution**- a starting substance in a chemical reaction; **Substance**- anything that has mass and takes up space; **Volume**- a phase of matter that has definite volume and definite shape. The particles of a solid are tightly bonded and cannot move around

### Comments

**Content:** Elements

**Duration:** October (3 week)

<b>Essential Question:</b>	How do elements combine to make other substances? How is an element's identity determined?
<b>Skill:</b>	<ul style="list-style-type: none"> <li>Using the periodic table, the students will Identify the groups or families and their properties</li> <li>Identify elements are the basic building blocks of matter.</li> <li>Identify the characteristics of elements of the periodic table.</li> <li>Explain the differences between and physical and chemical change.</li> </ul>
<b>Activities</b>	<ul style="list-style-type: none"> <li>Element Research Project</li> <li>Element Scavenger Hunt</li> <li>Element Game</li> </ul>
<b>Assessment:</b>	<ul style="list-style-type: none"> <li>Students will research elements to identify characteristics, uses, and real world application.</li> <li>Students will be able to explain how a new substance is formed when different types of atoms join together.</li> </ul>
<b>Resources:</b>	<ul style="list-style-type: none"> <li>Mark Twain Atoms: Building Blocks of Nature</li> <li>Mark Twain Elements and the Periodic Table Library</li> <li>Technology (computers, laptops, internet)</li> </ul>
<b>Standards:</b>	<p>3.2.6.A4. Differentiate between physical changes and chemical changes.</p> <p>3.2.6.A1. Distinguish the differences in properties of solids, liquids, and gases. Differentiate between volume and mass.</p> <p>3.2.6.A6. Science Inquiry</p>
<b>Vocabulary:</b>	<p><b>Chemical Reaction</b>- a substance produced in a chemical reaction; <b>Compressed</b>- the physical appearance of a sample of matter based on the kinetic energy of its particles. Common phases include solid, liquid, and gas; <b>Compound</b>- A substance made up of atoms of two or more elements that are chemically combined; <b>Density</b>- the smallest piece of a substance that is still that substance; <b>Dissolve</b>- two or more substances together; <b>Electron</b>- a phase of matter that has definite volume but no definite shape. Particles of liquid are loosely bonded, but can flow over and around one another; <b>Expansion</b>- a phase of matter that has no definite shape or</p>

volume. Particles of gas fly independently through space; **Gas**- an increase of volume; **Mass**- a subatomic particle with a positive charge; **Metal**- A substance that conducts heat and electricity well and is malleable; **Metalloids**- having characteristics of metals and nonmetals; **Mixture**- to incorporate one substance uniformly into another substance at the particle level; **Neutron**- a way to organize the elements based on atomic number and chemical property; **Non-metal**- A substance that does not conduct electricity and is not malleable; **Particle**- the ratio of mass and volume in a sample of matter; **Periodic Table of Element**- a characteristic of a substance that can be observed without changing it chemically, such as size, shape, density, and phase; **Phase**- reduced in volume as a result of applied pressure; **Physical Property**- a type of matter defined by a unique particle; **Proton**- a mixture formed when one substance dissolves in another; **Reactant**- a defined quantity of space; **Solid**-a subatomic particle with no charge; **Soluble**- a measure of the quantity of matter; **Solution**- a starting substance in a chemical reaction; **Substance**- anything that has mass and takes up space; **Volume**- a phase of matter that has definite volume and definite shape. The particles of a solid are tightly bonded and cannot move around

### Comments

**Content:** Energy

**Duration:** November (3 weeks)

<b>Essential Question:</b>	<p>What is energy?                  How can energy be transferred from one object or system to another?                  How does energy interact with matter to cause change and do work?                  What are different forms of energy?                  What are the three methods of heat transfer and how do particles interact when transferring heat by these methods?                  What is a system?</p>
<b>Skill:</b>	<ul style="list-style-type: none"> <li>• Identify the different types of energy. ie: mechanical energy, thermal energy, sound energy, light energy, chemical energy, and electrical energy</li> <li>• Identify how energy is transferred</li> <li>• Differentiate between potential and kinetic energy in real life situations</li> <li>• Identify the different types of nonrenewable and renewable energies</li> <li>• Explain how a change in energy, changes in matter</li> </ul>
<b>Activity:</b>	<ul style="list-style-type: none"> <li>• Potential and Kinetic Energy Sort</li> <li>• Energy Transformation with Real Life Items</li> <li>• Energy Brochure</li> </ul>
<b>Assessment:</b>	<ul style="list-style-type: none"> <li>• Given a set of matter the students will be able to identify the state of matter and the properties</li> <li>• Students will explain how the properties of matter changed during energy transfer.</li> <li>• Given a set of heat transfers the students will be able to determine if it in convection, conduction, or radiation.</li> <li>• Students will explain that energy is not created or destroyed it is transferred into different sources.</li> <li>• Students will apply to their daily lives.</li> </ul>
<b>Resources:</b>	<p>The Nature of Matter and Energy- Classroom Complete Press                  Instant Science Activities 4-5- Chalkboard Publishing</p>
<b>Standards:</b>	<p>3.2.7.A3. Explain how energy transfer can affect the chemical and physical properties of matter.                  3.2.6.A6 Science Inquiry                  3.2.6.B2 Differentiate between potential and kinetic energy                  3.2.6.B3 Explain the effect of heat on particle motion by describing what happens to particles during a phase change                  3.2.6.B6 Energy                  3.2.6.B7 Science Inquiry</p>

**Vocabulary:**

**Amplitude-** the distance in a wave from the resting position to the top of the crest or the bottom of the trough; **Chemical energy-**a change in which one or more new substances are formed; **Conduction-** the transfer of thermal energy that results from the collision of particles; **Conservation-** the careful use of resources so that they will last as long as possible; **Convection-** the transfer of thermal energy through the movement of a liquid or a gas; **Elastic Potential Energy-** the force pulling a stretched spring or rubber band back together; **Electrical Energy-** a form of energy resulting from the flow of electric charge (electrical) attraction or repulsion between charged particles; **Electromagnetic radiation-** light can travel across completely empty space; **Electromagnetic spectrum-** All energy waves that travel at the speed of light in a vacuum (radio, infrared, visible, x-rays, ultraviolet, and gamma rays); **Electrostatic force-** the attractive and repulsive forces associated with electrical charge and magnetism; **Fossil fuels-** An energy rich resources formed from the buried remains of once-living organisms; **Frequency-** has longer wavelength than visible light, these are heat waves; **Infrared-** has longer wavelength than visible light, these are heat waves; **Kinetic energy-**the type of energy that an object has because it is in motion; **Light energy-** travels in the form of waves and has wavelengths, frequencies, and amplitudes; **Magnetic force-** the basic force responsible for such effects as the action of electric motors and the attraction of magnets for iron; **Mechanical energy-** energy in an object. There are 2 forms: potential energy and kinetic energy; **Medium-** the material that waves travel through; **Microwave-** a type of radio wave that can pass through solid objects and other materials; **Nonrenewable-** an energy resource that once it is used up the resource is no longer available (i.e. coal); **Nuclear power-** created when the nucleus of an atom is split or combined; **Photosynthesis-** the process by which green plants use carbon dioxide, water, and sunlight to make their own food; **Pitch-** refers to how high or low a sound is; **Potential energy-**energy that is due to the position or condition of an object; **Radiation-** the transfer of thermal energy as waves; **Reflection-** the bouncing of light off a surface; **Refraction-** the bending of light as it passes from one material to another; **Renewable-** an energy resource that does not run out; **Sound energy-** travels in the form of a wave; **Thermal energy-** the kinetic energy of the moving particles of a substance or object; **Transfer-** when heat energy moves from one kind into another kind; **transform-** when energy changes from one kind to into another kind; **Ultraviolet-**light that has shorter wavelengths than visible light; **Visible light-** a small part of the spectrum that we can see; **Wavelength-** the distance from the middle of the crest of one wave to the middle of the crest of the next wave

**Comments**

**Content:** Force

**Duration:** November/December (2 weeks)

<b>Essential Question:</b>	How do forces affect motion? What relationships exist amongst force, weight, and acceleration?
<b>Skill:</b>	<ul style="list-style-type: none"> <li>Identify and use the fact that a force is a push or pull.</li> <li>Identify a net force is the sum of all the force acting on a mass.</li> <li>Identify and explain balanced and unbalanced forces in real world applications.</li> <li>Differentiate between contact forces and forces at a distance.</li> </ul>
<b>Activity:</b>	<ul style="list-style-type: none"> <li>Real world force matching activity</li> <li>Net forces sort</li> <li>Push and pull song</li> </ul>
<b>Assessment:</b>	<ul style="list-style-type: none"> <li>Draw and analyze illustrations of forces in motion.</li> <li>Analyze balance and unbalanced force illustrations.</li> </ul>
<b>Resources:</b>	Harcourt Science textbook pg. 600-01, 606-610, p. 618 Mark Twain- Force and Motion Series Bill Nye Force Video and Study Guide
<b>Standards:</b>	3.2.7.A3. Explain how energy transfer can affect the chemical and physical properties of matter 3.2.6.B6. Energy 3.2.6.B1. Explain how changes in motion require a force 3.2.6.B7 Science Inquiry
<b>Vocabulary:</b>	<b>Acceleration</b> - an objects change in velocity divided by the time it takes for that change to occur; <b>Air resistance</b> - a frictional force air exerts against a moving object; <b>Attraction</b> - a force pulling together; <b>Balanced force</b> - equal forces that act in opposite directions on an object and cancels on another out; <b>Buoyant force</b> - pushes upward on objects in a liquid or gas and opposes gravity; <b>Cancel</b> - arrows pointing in opposite directions causing net force to be zero; <b>Deceleration</b> - to reduce the speed of; <b>Electrical charge</b> - either negative or positive; <b>Electrostatic force</b> - force that acts between things that have a positive and negative charge; <b>exert</b> - to put forth a strength; <b>Friction</b> - a force that acts between any two surfaces in contact with one another and prevents or slows motion; <b>Force</b> - a push or a pull; <b>Gravity</b> - a force of attraction between particles that occurs because of their mass; <b>Gravitational force</b> - the force that acts between any two masses in the universe and pulls them towards one another; <b>Inertia</b> - the tendency of matter to resist a change in its state of motion; <b>Magnets</b> - objects of powerful

attraction; **Magnetic force**- pushes and pulls between magnetic poles; **Mass**- the amount of matter something has; **Matter**- anything that takes up space and has mass; **Net force**- the total of all the forces acting on an object; **Pull**- a force drawing someone in a particular direction; **Push**- an act of exerting force on something in order to move away; **Repel**- a force pushing apart; **Sliding motion**- the force of friction is large between rough surfaces and small between smooth surfaces; **Surface tension**- a force that occurs at the surface of a liquid; **Unbalanced force**- forces that do not cancel one another out; **Velocity**- the speed and direction of a moving object; **Weight**- the force of gravity pulling on the mass

### Comments

**Content:** Motion

**Duration:** December (2 weeks)

<b>Essential Question:</b>	<p>How do we model acceleration?                  How do forces affect motion?                  How are different motions incorporated in our everyday life?                  What are Newton's Three Law of Motion?</p>
<b>Skill:</b>	<ul style="list-style-type: none"> <li>• Calculate speed by identify distance and time.</li> <li>• Analyze and describe motion by graphing distance and time.</li> <li>• Identify various types of motion in everyday life</li> <li>• Differentiate and give examples of Newton's Three Law of Motion</li> </ul>
<b>Activity:</b>	<ul style="list-style-type: none"> <li>• Physics Car Race</li> <li>• Bubble Gum Physics</li> <li>• Speed/motion graphs</li> <li>• Comparing speeds of animals</li> </ul>
<b>Assessment:</b>	<ul style="list-style-type: none"> <li>• Gather, analyze, and organize data</li> <li>• Transform narrative accounts of motion events into graphic representations</li> <li>• Explain slope and constant speed on a graph</li> </ul>
<b>Resources:</b>	<p>Harcourt Science textbook pg. 598-99; 602; 612-17                  Mark Twain Force and Motion Series                  Graph Paper                  Toy Cars                  Bubble Gum</p>
<b>Standards:</b>	<p>3.2.7.A3. Explain how energy transfer can affect the chemical and physical properties of matter                  3.2.6.B6. Energy                  3.2.6.B1. Explain how changes in motion require a force                  3.2.6.B7 Science Inquiry</p>
<b>Vocabulary:</b>	<p><b>Amplitude</b>- the height of a wave; <b>Distance</b>- the amount of space between two places;  <b>Frequency</b>- the number of vibrations or waves in a given amount of time; <b>Graph</b>- a diagram showing a relationship between two variable; <b>Inertia</b>- the tendency of matter to resist a change in its state of motion; <b>Medium</b>- the material waves move through; <b>Pitch</b>- the quality of sound represented by the rate of vibrations produced; <b>Position</b>- the place where a thing is; <b>Rotation</b>- the turning of an object on an axis; <b>Seismic</b>- the kind of wave an earthquake makes; <b>Slope</b>- a horizontal or vertical line; slant up or down; <b>Speed</b>- a distance traveled divided by the time it takes to get there; <b>Velocity</b>- the speed and direction of a moving object; <b>Vibrate</b>- moving back and forth or up and down; <b>Vibration</b>- moving back and forth; <b>Wave</b>- a disturbance that carries energy through matter or space; <b>Wavelength</b>- the distance from the middle of the crest of one</p>

wave to the middle of the crest of the next wave.

**Content:** Simple Machines

**Duration:** January (3 weeks)

<b>Essential Question:</b>	<p>What is work?                  How does force, motion, and work go together?                  What are simple machines?                  How do simple machines help you in the real world?                  What are compound machines?                  What are Newton’s Law of Motion?</p>
<b>Skill:</b>	<ul style="list-style-type: none"> <li>• Compare and contrast force, motion, and work</li> <li>• Identify the six kinds of simple machines</li> <li>• Distinguish the differences between simple and compound machines</li> <li>• Analyze how simple and compound machines help in everyday life</li> <li>• Create simple and compound machines</li> <li>• Describe and apply Newton’s Law of motion</li> </ul>
<b>Activity:</b>	<ul style="list-style-type: none"> <li>• Activity 1- First Class Lever</li> <li>• Create your own compound machine to help in real life</li> <li>• Simple Machine Activity Cards and Building</li> <li>• Mouse Trap Game</li> </ul>
<b>Assessment:</b>	<ul style="list-style-type: none"> <li>• Students will create and build simple and compound machines</li> <li>• Students will explain how simple and compound machines affect their everyday lives</li> </ul>
<b>Resources:</b>	<p>Harcourt Science-Chapter 17                  Simple Machines- Mark Twain                  Force, Motion, and Simple Machines- Classroom Complete Press</p>
<b>Standards:</b>	<p>3.2.6.B1. Explain how changes in motion require a force                  3.2.6.B7 Science Inquiry</p>
<b>Vocabulary:</b>	<p><b>Compound machines-</b> a machine that combines two or more simple machines to do one job; <b>Effect force-</b> the force you apply; <b>Effort distance-</b> the distance you have to push or pull a lever; <b>Energy-</b> the ability to cause change in matter; <b>Fulcrum-</b> the fixed point that the effort arm of a lever moves around; <b>Inclined plane-</b> any flat, sloping surface used a simple machine; <b>Joule-</b> measurement of work; <b>Kinetic energy-</b> the energy of motion; <b>Lever-</b> a simple machine that is an arm or rod that turns around a fixed point; <b>Meter-</b> the basic unit of length of the metric system; <b>Metric system-</b> a system of weights and measures based on meter; <b>Newton-</b></p>

measurement of force; **Pivot**- something on which something else turns; **Potential energy**- energy that is due to the position or condition of an object; **Power**- the speed at which work is done; **Pulley**- a simple machine that is an arm or rod that turns around a fixed point; **Resistance distance**- the distance the load moves; **Resistance force**- the force a lever applies; **Screw**- a simple machine that is an incline plane wrapped around a cylinder or a cone; **Simple machine**- a machine with only one kind of movement; **Thread**- the grooves of a screw; **Watt**- one joule per second; **Wedge**- a simple machine made of two inclined planes placed back to back; **Wheel and axle**- a simple machine that is a large wheel and a small wheel that are connected and turn together; **Work**- the result that occurs when a force causes an object to move in the direction of the force