



6th Grade Physical Science

Approved by KSD Board of Education: (May 19, 2025)

Course Description:

In 6th Grade Physical Science, students explore the physical world. They will investigate the building blocks of matter, learn about the transfer of energy, dive into the waves and the transfer of energy through different mediums, and analyze the effects of forces on objects. Attention will be given to hands-on experiences.

Grade Level: 6th Grade

Unit Scope and Sequence

Unit 1: Matter and Its Changes

Unit 2: Energy

Unit 3: Waves

Unit 4: Force and Motion

Course Enduring Understandings:

- Matter is composed of particles, and its properties are determined by the arrangement and interactions of these particles.
- Energy exists in various forms and can be transferred and transformed.
- Forces influence the motion of objects, and the motion of objects can be described and predicted.
- Waves transfer energy through matter or space.

Course Essential Questions:

- How do the structure and properties of matter influence the world around us?
- What is energy, and how does it transform and transfer?
- How do waves transmit energy and information?
- How do forces affect the motion of objects?
- How can we use scientific inquiry to investigate the physical world?

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Unit 1: Matter and Its Changes

Students will explore the physical world beginning with elements, molecules and compounds. They will learn to identify physical and chemical changes and to support their observations with evidence.

Unit Essential Learning Targets	
<i>Enduring Understandings</i>	<i>Essential Questions</i>
- Everything is made of matter. - Matter cannot be created or destroyed; it can just change forms within a system. - Matter has both physical and chemical properties that undergo physical and chemical changes. - Synthetic materials are derived from natural resources, and they impact the world.	- How are elements, molecules, and compounds related, and how are they represented in models? - How does thermal energy impact chemical changes in matter? - What is the difference between physical and chemical changes? - How does the production of synthetic materials impact the world both positively and negatively?
<i>Students must know:</i>	<i>Students must be able to:</i>
- The definitions of: atom, elements, molecules, compounds, chemical change, chemical reaction, and physical change. - Law of Conservation of Matter - Matter is conserved in a chemical reaction - The Periodic Table of Elements is organized by atomic makeup. - The definitions of: natural materials and synthetic materials.	- Develop models of simple to complex atomic compounds (Examples: ammonia, methanol, sodium chloride) - Differentiate between natural and synthetic materials. - Identify, after mixing two substances, when a physical or chemical change occurs in matter. - Develop a model that demonstrates the Law of Conservation of Matter, showing how the total number of atoms remains the same during a chemical reaction. - Analyze and interpret data using a Claim-Evidence-Reasoning format. - Use the Periodic Table of Elements to understand properties of matter. - Construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

6th Grade Physical Science Unit 1: Matter and Its Changes

Missouri Learning Standards

Priority Standard: Develop models to describe the atomic composition of simple molecules and extended structures (6-8.PS1.A.1).

Priority Standard: Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred (6-8.PS1.A.2).

Priority Standard: Gather and make sense of information to describe that synthetic materials come from natural resources and how they impact society (6-8.PS1.A.3).

Priority Standard: Develop and use a model to describe how the total number of atoms remains the same during a chemical reaction and thus mass is conserved (6-8.PS1.B.1).

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Unit 2: Energy

Students will conduct investigations to provide evidence explaining energy transfer within a system, thus explaining the Law of Conservation of Energy. Additionally, they will analyze data to demonstrate relationships between mass, speed and kinetic energy.

Unit Essential Learning Targets	
<i>Enduring Understandings</i>	<i>Essential Questions</i>
• Energy cannot be created or destroyed; it can just be transferred within a system. • Investigations can provide evidence to support how energy can be transferred from one form to another within a system.	• What is the relationship between potential and kinetic energy? • What factors affect changes in both potential and kinetic energy? • How can evidence be collected to show changes in thermal energy in a system?
<i>Students must know:</i>	<i>Students must be able to:</i>
• The definitions of: thermal energy, kinetic energy, potential energy, mass, speed, temperature, and energy transfer. • Particles have kinetic energy, and that kinetic energy changes with the changes in the state of the matter. • Law of Conservation of Energy	• Identify when energy transfer has occurred. • Design, construct, and test a device that either minimizes or maximizes thermal energy transfer. • Analyze and interpret data using a Claim-Evidence-Reasoning format. • Use data and a graph to demonstrate the relationships between kinetic energy, mass, and speed. • Develop and use a model to describe how arrangements of objects interacting at a distance changes the relative amounts of potential energy stored in the system. • Design and implement an investigation to determine changes in the average kinetic energy of particles as measured by temperature. • Provide evidence to support the Law of Conservation of Energy.

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Unit 2: Energy

Missouri Learning Standards

Priority Standard: Construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes (6-8.PS1.B.2).

Priority Standard: Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object (6-8.PS3.A.1).

Priority Standard: Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system (6-8.PS3.A.2).

Priority Standard: Plan and conduct an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample (6-8.PS3.A.4).

Priority Standard: Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object (6-8.PS3.B.1).

Priority Standard: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (6-8.ETS1.A.1).

Priority Standard: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved (6-8.ETS1.B.3).

Priority Standard: Evaluate compelling design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem (6-8.ETS1.B.1).

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Unit 3: Waves

Students will be able to predict characteristics, properties, and behaviors of waves, sound, and light.

Unit Essential Learning Targets	
<i>Enduring Understandings</i>	<i>Essential Questions</i>
• Waves transfer energy, not matter. • There are different types of waves, and they act both similarly and differently. • Waves affect the world around us.	• What are the differences between mechanical and electromagnetic waves? • What relationships exist between level of transparency, lenses, and types of medium as they relate to wave energy interactions? • How do pitch and loudness affect sound waves? • How do wavelength, frequency, and amplitude affect mechanical waves? • What is the difference between transverse waves, longitudinal waves, and electromagnetic waves?
<i>Students must know:</i>	<i>Students must be able to:</i>
• The definitions of: longitudinal wave, transverse wave, electromagnetic wave (including light waves), crest, trough, amplitude, wavelength, reflection, absorption, refraction, medium, and transmission. • Electromagnetic Spectrum. • Wave properties of loudness and pitch. • Types of lenses: concave and convex. • Levels of transparency including translucent, transparent, and opaque.	• Use mathematical representations to explain the relationship between the amplitude of a wave and its energy. • Develop and use a model to show how waves are reflected, absorbed, and transmitted through various materials. • Analyze and interpret data using a Claim-Evidence-Reasoning format.

6th Grade Physical Science Unit 3: Waves

Missouri Learning Standards

Priority Standard: Create and analyze a graph to use as evidence to support the claim that gravitational interactions depend on the mass of interacting objects (6-8.PS2.B.2).

Priority Standard: Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave (6-8.PS4.A.1).

Priority Standard: Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials (6-8.PS4.A.2).

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Unit 4: Forces and Motion

Students will focus on their understanding of different types of forces and their effect on the movement of an object. Attention will be given to demonstrating Newton's three Laws of Motion.

Unit Essential Learning Targets	
<i>Enduring Understandings</i>	<i>Essential Questions</i>
• Gravitational interactions depend on the mass of interacting objects. • An object at rest will stay at rest and an object in motion will stay in motion until an unbalanced force acts upon it (Newton's 1st Law). • Force and mass contribute to an object's acceleration (Newton's 2nd Law). • For every action there is an equal but opposite reaction (Newton's 3rd Law). • There are different types of forces.	• How does the force of gravity change based on the mass of the objects? • How do forces change an object's motion, speed, and acceleration? • How are types of forces different?
<i>Students must know:</i>	<i>Students must be able to:</i>
• Newton's three Laws of Motion • The definitions of: balanced forces and unbalanced forces. • The different forces that interact with objects (contact forces: applied, spring, air resistance, friction, normal, tension and non-contact forces: magnetic, electrical, gravitational).	• Apply physical principles to design a solution that minimizes the force of an object during a collision and develop an evaluation of the solution. • Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. • Explain how different forces interact with objects; this includes contact (applied, spring, air resistance, friction, normal and tension) and non-contact (magnetic, electrical, gravitational). • Calculate speed, time, and distance given a set of data. • Analyze diagrams and collect data to determine the factors that affect the strength of electric and magnetic forces. • Conduct an experiment that shows evidence that fields exist between objects that do not have contact. • Create and analyze a graph to use as evidence to support the claim that gravitational interactions depend on the mass of interacting objects. • Analyze and interpret data using a Claim-Evidence-Reasoning format. • Explain how forces change an object's motion, speed, and acceleration.

6th Grade Physical Science Unit 4: Forces and Motion

Missouri Learning Standards

Priority Standard: Apply physics principles to design a solution that minimizes the force of an object during a collision and develop an evaluation of the solution (6-8.PS2.A.1).

Priority Standard: Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object (6-8.PS2.A.2).

Priority Standard: Analyze diagrams and collect data to determine the factors that affect the strength of electric and magnetic forces (6-8.PS2.B.1).

Priority Standard: Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact (6-8.PS2.B.3).

Priority Standard: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved (6-8.ETS1.B.3).

Priority Standard: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (6-8.ETS1.B.2).