Montana Science Model Curriculum Guide by Grade Level: Grades 6-8 Physical Science

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Contents

Resources	Three Dimensions		
	[Disciplinary Core Ideas (DCI's)](#)	[Science and Engineering Practices (SEP's)](#)	[Crosscutting Concepts (CCC's)](#)
Paul Anderson Videos: Details on each component of the standards Next Generation Science Standards (NGSS) at National Science Teachers Association (NSTA) Hub: Detailed explanations of the three dimensions, videos of what it looks like in the classroom, curriculum guidance, and classroom resources Evidence Statements: Observations of what students should know and be able to do when they perform the standard. Helpful for formative and summative assessments The Framework: The framework for Montana Science Standards and for the Next Generation Science Standards NGSS Storylines: These storylines explain questions that students should investigating and how by grade level; they paint the big picture of the big ideas STEM Teacher Tools: This site has every resource necessary to implement the new standards *Read more about the three dimensions in the NRC Framework online here (NGSS for States, By States)*	Disciplinary core ideas have the power to focus K–12 science curriculum, instruction and assessments on the most important aspects of science. To be considered core, the ideas should meet at least two of the following criteria and ideally all four: • Have broad importance across multiple sciences or engineering disciplines or be a key organizing concept of a single discipline; • Provide a key tool for understanding or investigating more complex ideas and solving problems; • Relate to the interests and life experiences of students or be connected to societal or personal concerns that require scientific or technological knowledge; • Be teachable and learnable over multiple grades at increasing levels of depth and sophistication. Disciplinary ideas are grouped in four domains: the physical sciences; the life sciences; the earth and space sciences; and engineering, technology and applications of science.	The practices describe behaviors that scientists engage in as they investigate and build models and theories about the natural world and the key set of engineering practices that engineers use as they design and build models and systems. The National Research Council (NRC) uses the term practices instead of a term like "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. Part of the NRC's intent is to better explain and extend what is meant by "inquiry" in science and the range of cognitive, social, and physical practices that it requires. Although engineering design is similar to scientific inquiry, there are significant differences. For example, scientific inquiry involves the formulation of a question that can be answered through investigation, while engineering design involves the formulation of a problem that can be solved through design. Strengthening the engineering aspects of the Next Generation Science Standards will clarify for students the relevance of science, technology, engineering and mathematics (the four STEM fields) to everyday life. (NGSS for States, By States).	Crosscutting concepts have application across all domains of science. As such, they are a way of linking the different domains of science. They include: Patterns, similarity, and diversity; Cause and effect; Scale, proportion and quantity; Systems and system models; Energy and matter; Structure and function; Stability and change. The Framework emphasizes that these concepts need to be made explicit for students because they provide an organizational schema for interrelating knowledge from various science fields into a coherent and scientifically-based view of the world. (NGSS for States, By States).

Grade 6-8 Physical Science

Montana Standard *Students must know and be able to:*	Disciplinary Core Ideas (DCI's)	Science and Engineering Practices (SEP's)	Crosscutting Concepts (CCC's)
develop and critique models that describe the atomic composition of simple molecules and extended structures MS-PS1-1. NGSS Identifier	PS1.A	developing and using models	scale proportion and quantity
analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred MS-PS1-2. NGSS Identifier	PS1.A PS1.B	analyze and interpret data	patterns
gather information to describe that synthetic materials come from natural resources and impact society MS-PS1-3. NGSS Identifier	PS1.A PS1.B	obtaining, evaluating, and communicating information	structure and function
develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed MS-PS1-4. NGSS Identifier	PS1.A PS3.A	developing and using models	cause and effect
develop, use, and critique a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved MS-PS1-5. NGSS Identifier	PS1.B	developing and using models	energy and matter: flows, cycles and conservation
undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes MS-PS1-6. NGSS Identifier	PS1.B ETS1.B ETS1.C	construct explanations and design solutions	energy and matter: flows, cycles and conservation

apply Newton's Third Law of Motion to design a solution to a problem involving the motion of two colliding objects MS-PS2-1. NGSS Identifier	PS2.A	construct explanations and design solutions	system and system models
plan 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 MS-PS2-2. NGSS Identifier	PS2.A	planning and carrying out investigations	stability and change
ask questions about data to determine the factors affecting electric and magnetic force strengths MS-PS2-3. NGSS Identifier	PS2.B	asking questions and defining problems	cause and effect
construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the mass of interacting objects MS-PS2-4. NGSS Identifier	PS2.B	engaging in argument from evidence	system and system models
design and conduct an investigation to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact MS-PS2-5. NGSS Identifier	PS2.B	planning and carrying out investigations	cause and effect
construct and interpret graphic displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object MS-PS3-1. NGSS Identifier	PS3.A	analyze and interpret data	scale proportion and quantity

develop and critique models to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system MS-PS3-2. NGSS Identifier	PS3.A PS3.C	developing and using models	system and system models
apply scientific principles to design, construct, and test a device that minimizes or maximizes thermal energy transfer MS-PS3-3. NGSS Identifier	PS3.A PS3.B ETS1.A ETS1.B	construct explanations and design solutions	energy and matter: flows, cycles and conservation
plan 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 MS-PS3-4. NGSS Identifier	PS3.A PS3.B	planning and carrying out investigations	scale proportion and quantity
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 MS-PS3-5. NGSS Identifier	PS3.B	engaging in argument from evidence	energy and matter: flows, cycles and conservation
use mathematical representations to describe a simple model for waves that includes how the amplitude and wavelength of a wave is related to the energy in a wave MS-PS4-1. NGSS Identifier	PS4.A	using mathematics & computational thinking	patterns
develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials MS-PS4-2. NGSS Identifier	PS4.A PS4.B	developing and using models	structure and function