

SVSU LOCAL SCIENCE CURRICULUM GUIDE

SIXTH GRADE

Created using the [Next Generation Science Standards](#)

Physical Science: (SVSU 6th Grade Units: Structures and Properties of Matter, Forces and Interactions)

MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.

MS-PS1-4. 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-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.*

MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces

MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects

MS-PS3-2. 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

Life Sciences (SVSU Units: Cells: Structure and Function, Interdependent Relationships in Ecosystems)

MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem

Earth and Space Sciences (SVSU Units: Earth's Place in the Universe, Geologic Processes & Earth's Resources, Water Cycle)

MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.

MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

Engineering Design (Embedded in SVSU Science Units Above)

MS-ETS 1-1 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.

MS-ETS 1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS 1-3 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.

MS-ETS 1-4 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.

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Instructional Focus Areas

Science and Engineering Practices	Disciplinary Core Ideas	Cross Cutting Concepts
Physical Science Developing and Using Models - Develop a model to predict and/or describe phenomena. (MS-PS1-1),(MS-PS1-4) ----- <i>Connections to Nature of Science</i> Scientific Knowledge is Based on Empirical Evidence - Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS1-2) Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena - Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5) Asking Questions and Defining Problems - Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles. (MS-PS2-3) Constructing Explanations and Designing Solutions - Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1) Engaging in Argument from Evidence - Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-PS2-4) ----- <i>Connections to Nature of Science</i>	Physical Science PS1.A: Structure and Properties of Matter - Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1) - Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4) - In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4) - Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1) - The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4) PS3.A: Definitions of Energy - The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4) PS2.A: Forces and Motion - For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton’s third law). (MS-PS2-1) PS2.B: Types of Interactions	Physical Science Cause and Effect - Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4) Scale, Proportion, and Quantity - Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1) ----- <i>Connections to Engineering, Technology, and Applications of Science</i> Interdependence of Science, Engineering, and Technology - Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3) Influence of Science, Engineering and Technology on Society and the Natural World - The uses of technologies and any limitation on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3) Cause and Effect - Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS2-3),(MS-PS2-5) Systems and System Models - Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows

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<i>Scientific Knowledge is Based on Empirical Evidence</i> - Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS2-2),(MS-PS2-4) Developing and Using Models - Develop a model to describe unobservable mechanisms. (MS-PS3-2) ----- <i>Connections to Nature of Science</i> Scientific Knowledge is Based on Empirical Evidence - Science knowledge is based upon logical and conceptual connections between evidence and explanations (MS-PS3-4),(MS-PS3-5) Life Science Developing and Using Models - Develop and use a model to describe phenomena. (MS-LS1-2) Planning and Carrying Out Investigations - Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1) ----- <i>Connections to Nature of Science</i> Scientific Knowledge is Based on Empirical Evidence - Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6) Constructing Explanations and Designing Solutions - Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2) ----- <i>Connections to Nature of Science</i>	- Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3) - Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4) PS3.A: Definitions of Energy - A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2) PS3.C: Relationship Between Energy and Forces - When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2) Life Science LS1.A: Structure and Function - All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1) - Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2) LS2.A: Interdependent Relationships in Ecosystems - Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)	within systems. (MS-PS2-1),(MS-PS2-4) ----- <i>Connections to Engineering, Technology, and Applications of Science</i> Influence of Science, Engineering, and Technology on Society and the Natural World - The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-PS2-1) Systems and System Models - Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems. (MS-PS3-2) Life Science Scale, Proportion, and Quantity - Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1) Structure and Function - Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2) ----- <i>Connections to Engineering, Technology and Applications of Science</i> Interdependence of Science, Engineering, and Technology - Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS1-1)
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Scientific Knowledge is Based on Empirical Evidence - Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4) Earth & Space Science Developing and Using Models - Develop and use a model to describe phenomena. (MS-ESS1-1),(MS-ESS1-2) Analyzing and Interpreting Data - Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3) Developing and Using Models - Develop a model to describe unobservable mechanisms. (MS-ESS2-4) Analyzing and Interpreting Data - Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3) Constructing Explanations and Designing Solutions - Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. (MS-ESS2-2) ----- <i>Connections to Nature of Science</i> Scientific Knowledge is Open to Revision in Light of New Evidence - Science findings are frequently revised and/or reinterpreted based on new evidence. (MS-ESS2-3) Constructing Explanations and Designing Solutions - Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-ESS3-1)	Earth & Space Science ESS1.A: The Universe and Its Stars - Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) ESS1.B: Earth and the Solar System - The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MS-ESS1-3) - This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1) ESS1.C: The History of Planet Earth - Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE),(secondary to MS-ESS2-3) ESS2.A: Earth's Materials and Systems - The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2) ESS2.B: Plate Tectonics and Large-Scale System Interactions - Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)	----- <i>Connections to Nature of Science</i> Science is a Human Endeavor - Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3) Patterns - Patterns can be used to identify cause and effect relationships. (MS-LS2-2) ----- <i>Connections to Engineering, Technology, and Applications of Science</i> Influence of Science, Engineering, and Technology on Society and the Natural World - The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-LS2-5) ----- <i>Connections to Nature of Science</i> Scientific Knowledge Assumes an Order and Consistency in Natural Systems - Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3) Science Addresses Questions About the Natural and Material World - Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS2-5) Earth & Space Science Patterns - Patterns can be used to identify cause-and-effect relationships. (MS-ESS1-1)
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	ESS2.C: The Roles of Water in Earth's Surface Processes • Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4) • Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4) • Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2) ESS3.A: Natural Resources • Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)	Scale, Proportion, and Quantity • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3),(MS-ESS1-4) ----- <i>Connections to Engineering, Technology, and Applications of Science</i> Interdependence of Science, Engineering, and Technology • Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (MS-ESS1-3) ----- <i>Connections to Nature of Science</i> Scientific Knowledge Assumes an Order and Consistency in Natural Systems • Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1-1),(MS-ESS1-2) Patterns • Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3) Scale Proportion and Quantity • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS2-2) Energy and Matter • Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4) Cause and Effect • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1),(MS-ESS3-4) ----- <i>Connections to Engineering, Technology, and Applications of Science</i>
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		Influence of Science, Engineering, and Technology on Society and the Natural World • All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-1),(MS-ESS3-4) ----- <i>Connections to Nature of Science</i> Science Addresses Questions About the Natural and Material World • Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-ESS3-4)
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