



Alignment Document  
State of Minnesota  
And  
Aventa Learning Earth Science

## Minnesota K-12 Academic Standards in Science Curriculum and Assessment Alignment Form

Grade Level	Strand	Sub-Strand	Standard	Benchmarks	Curriculum	Assessment
9-12	I. HISTORY AND NATURE OF SCIENCE	A. Scientific World View	The student will understand the nature of scientific ways of thinking and that scientific knowledge changes and accumulates over time.	<ol style="list-style-type: none"> <li>1. The student will be able to distinguish among hypothesis, theory and law as scientific terms and how they are used to answer a specific question.</li> <li>2. The student will be able to explain how scientific and technological innovations as well as new evidence can challenge portions of or entire accepted theories and models including but not limited to cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease and big bang theory.</li> <li>3. The student will recognize that in order to be valid, scientific knowledge must meet certain criteria including that it: be consistent with experimental, observational and inferential evidence about nature; follow rules of logic and reporting both methods and procedures; and, be falsifiable and open to criticism.</li> <li>4. The student will explain how traditions of ethics, peer review, conflict and general consensus influences the conduct of science.</li> <li>5. The student will recognize that some scientific ideas are incomplete, and opportunity exists in these areas for new advances.</li> </ol>	Using the Planet Earth Unit Curriculum, students understand what is earth science, examine the branches of earth science, explore potential career paths in earth science, understand the importance of earth science, consider the earth as a series of interrelated systems: the climate system, the plate tectonic system, and the geointerior system, and think like an earth scientist by utilizing the scientific method.	

Grade Level	Strand	Sub-Strand	Standard	Benchmarks	Curriculum	Assessment
9–12	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will design and conduct a scientific investigation.	<ol style="list-style-type: none"> <li>1. The student will design and complete a scientific experiment using scientific methods by determining a testable question, making a hypothesis, designing a scientific investigation with appropriate controls, analyzing data, making conclusions based on evidence and comparing conclusions to the original hypothesis and prior knowledge.</li> <li>2. The student will distinguish between qualitative and quantitative data.</li> <li>3. The student will apply mathematics and models to analyze data and support conclusions.</li> <li>4. The student will identify possible sources of error and their effects on results.</li> <li>5. The student will know that professional scientists and engineers have ethical codes.</li> <li>6. The student will give examples of how different domains of science use different bodies of scientific knowledge and employ different methods to investigate questions.</li> </ol>	Using the Planet Earth Unit Curriculum, students will understand the importance of earth science; consider the earth as a series of interrelated systems: the climate system, the plate tectonic system, and the geointerior system, and think like an earth scientist by utilizing the scientific method.	

Grade Level	Strand	Sub-Strand	Standard	Benchmarks	Curriculum	Assessment
9– 12	I. HISTORY AND NATURE OF SCIENCE	C. Scientific Enterprise	The student will understand the relationship between science and technology and how both are used.	<ol style="list-style-type: none"> <li>1. The student will compare and contrast the purposes and career opportunities of engineering, technology and science.</li> <li>2. The student will provide an example of a need or problem identified by science and solved by engineering or technology.</li> <li>3. The student will provide an example of how technology facilitates new discoveries and the development of scientific knowledge.</li> <li>4. The student will know that technological changes and scientific advances are often accompanied by social, political, environmental and economic changes.</li> <li>5. The student will recognize that science and technology are influenced by cultural backgrounds and beliefs and by social needs, attitudes, values and limitations.</li> </ol>	Using the Planet Earth Unit Curriculum, students understand what is earth science, examine the branches of earth science, explore potential career paths in earth science, understand the importance of earth science, consider the earth as a series of interrelated systems: the climate system, the plate tectonic system, and the geointerior system, and think like an earth scientist by utilizing the scientific method.	
9–12	I. HISTORY AND NATURE OF SCIENCE	D. Historic Perspectives	The student will recognize the historical and cultural context of scientific endeavors and how they influence each other.	<ol style="list-style-type: none"> <li>1. The student will be able to trace the development of a scientific advancement, invention or theory and its impact on society.</li> <li>2. The student will provide examples of scientific advancements contributed by other civilizations and cultures.</li> <li>3. The student will compare and contrast the differences between scientific theories and theories from other bodies of knowledge, and the importance of each in a science discussion.</li> </ol>	Using the Planet Earth Unit Curriculum, students understand what is earth science, examine the branches of earth science, explore potential career paths in earth science, understand the importance of earth science, consider the earth as a series of interrelated systems: the climate system, the plate tectonic system, and the geointerior system, and think like an earth scientist by utilizing the scientific method.	

Grade Level	Strand	Sub-Strand	Standard	Benchmarks	Curriculum	Assessment
9-12	II. PHYSICAL SCIENCE	A. Structure of Matter	The student will understand the nature of matter including its forms, properties and interactions.	<ol style="list-style-type: none"> <li>1. The student will identify protons, neutrons and electrons as the major components of the atom, their mass relative to one another, their arrangement and their charge.</li> <li>2. The student will be able to explain the relationship of an element's position on the periodic table to its atomic number and atomic mass.</li> <li>3. The student will compare and contrast the properties of an element and its isotopes, and describe how isotopes can be used in research, medicine and industry.</li> <li>4. The student will use the periodic table to identify regions, families, groups and periods.</li> <li>5. The student will explain how neutral atoms become ions.</li> <li>6. The student will be able to explain how atoms form compounds through bonding.</li> <li>7. The student will compare and contrast the states of matter in terms of interactions between particles.</li> <li>8. The student will differentiate between an atom and a molecule.</li> <li>9. The student will differentiate between an element and compound.</li> </ol>	Using the Minerals, Rocks and Rock Cycle Curriculum, students will Understand what are minerals and rocks. Examine the building blocks and chemical bonding of matter. Know how atoms combine to form the crystal structures of minerals. Explore how the atomic (crystalline) structure and chemical bonds of minerals are linked to the physical properties of minerals.	

Grade Level	Strand	Sub-Strand	Standard	Benchmarks	Curriculum	Assessment
9-12	II. PHYSICAL SCIENCE	B. Chemical Reactions	The student will describe chemical reactions and the factors that influence them.	<ol style="list-style-type: none"> <li>1. The student will describe chemical reactions using words and symbolic equations.</li> <li>2. The student will explain the influence of temperature, surface area, agitation and catalysts on the rate of a reaction.</li> <li>3. The student will distinguish between a chemical reaction and a nuclear reaction.</li> <li>4. The student will explain how the rearrangement of atoms and molecules in a chemical reaction illustrates conservation of mass.</li> <li>5. The student will describe how combining acids and bases produce a neutral solution.</li> </ol>	Using the Minerals, Rocks and Rock Cycle Curriculum, students will Understand what are minerals and rocks. Examine the building blocks and chemical bonding of matter. Know how atoms combine to form the crystal structures of minerals. Explore how the atomic (crystalline) structure and chemical bonds of minerals are linked to the physical properties of minerals.	

Grade Level	Strand	Sub-Strand	Standard	Benchmarks	Curriculum	Assessment
	III. EARTH AND SPACE SCIENCE	A. Earth Structure and Processes	The student will understand that the interactions of the atmosphere, biosphere, lithosphere, hydrosphere and space have resulted in ongoing change of the Earth system over geologic time.	<ol style="list-style-type: none"> <li>1. The student will identify the internal and external sources of energy for the Earth.</li> <li>2. The student will apply the laws of thermodynamics to explain the cycling of materials and transfer of energy in the Earth system.</li> <li>3. The student will illustrate how biological processes have played significant roles in determining the character of the atmosphere, biosphere, hydrosphere and lithosphere over time.</li> <li>4. The student will use the theory of plate tectonics to analyze relationships among earthquakes, volcanoes, mountains fossil deposits, rock layers and ocean features.</li> <li>5. The student will describe how glaciers, gravity, wind, temperature changes, waves and rivers cause weathering and erosion.</li> <li>6. The student will describe the rock cycle and compare and contrast the processes responsible for the formation of igneous, sedimentary and metamorphic rocks.</li> <li>7. The student will use evidence found in fossils, rock layers, ice cores, radiometric dating and globally gathered data to explain how Earth has changed over short and long periods of time.</li> </ol>	<p>Using the Planet Earth Unit Curriculum, students will understand the importance of earth science; consider the earth as a series of interrelated systems: the climate system, the plate tectonic system, and the geointerior system, and think like an earth scientist by utilizing the scientific method.</p> <p>Using the Minerals, Rocks and Rock Cycle Curriculum, students will understand that rocks are classified based upon their mineral content and texture. Understand the three main types of rocks in terms of their formation and classification. Know the different types of igneous rock bodies (intrusive and extrusive). Understand the processes that allow sediments to become sedimentary rocks. Understand the causes and kinds of metamorphism. Explore the interactions between Rocks, Geologic Processes (igneous, sedimentary, and metamorphic), the Rock Cycle, the Climate System, and the Plate Tectonic System.</p> <p>In the Plate Tectonics, Volcanoes, Earthquakes, and Deformation of Earth's Crust, Unit Curriculum, students will know the basic components of plate tectonics and its history of development. Examine the geologic characteristics of the different types of plate boundaries. Understand how the age of the</p>	<p>Students define various Geologic Time vocabulary words. Students discuss and analyze the role of climate change on the Earth's atmosphere, biosphere, hydrosphere and lithosphere. Students discuss and analyze the plate tectonics theory and it's relationships to Earth's features. Students research and discuss soil erosion and desertification. Students discuss the rock cycle with relationship to plate tectonics and climate systems. Students discuss various evidences of Earth's age.</p>

Grade Level	Strand	Sub-Strand	Standard	Benchmarks	Curriculum	Assessment
9-12	III EARTH AND SPACE SCIENCE	A. Earth Structure and Processes	The student will investigate the impact humans have on the environment.	1. The student will identify and research an environmental issue and evaluate its impact.	In the Weathering, Erosion, and Deposition, Glaciers and Deserts Unit, students will understand how weathering relates to the rock cycle. Examine how physical and chemical weathering work. Know that soils form as the products of physical and chemical weathering. Understand how soil formation is closely linked to climate. Understand why soil erosion is a worldwide environmental problem. Identify the processes of how glaciers form and move. Examine the relationship between climate change and why geologists think that ice ages have occurred in the past. Understand how glaciers erode bedrock, transport and deposit sediments, and shape the Earth's surface (landscapes). Explore the key components to the last ice age during the Pleistocene glaciation period of Earth's history including the factors that caused it. Know the relationship between winds and erosion, transport, and deposition. Understand what factors contribute to the existence of desert regions on Earth. Identify the features characteristic of desert landscapes. Examine how human activities may play a role in the process of desertification.	Students research and discuss soil erosion in a farming community, desertification, and global warming.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks	Curriculum	Assessment
9–12	III. EARTH AND SPACE SCIENCE	B. The Water Cycle, Weather and Climate	The student will explain the causes and effects of the Earth’s atmospheric and hydrologic processes.	<ol style="list-style-type: none"> <li>1. The student will explain how the transfer of energy and motions of the Earth contribute to global climatic processes including wind, waves and ocean currents.</li> <li>2. The student will trace the cyclical movement of carbon and water through the lithosphere, hydrosphere, atmosphere and biosphere.</li> <li>3. The student will demonstrate the effect of the Earth’s tilt, rotation and revolution on the seasons, day length and tides.</li> <li>4. The student will identify, predict and investigate the factors that influence the quality of water and how it can be reused, recycled and conserved.</li> <li>5. The student will discuss the impact of the use of natural resources and other human activities on the Earth’s climate.</li> </ol>	<p>In the Atmosphere and Climate Unit, students will Describe the layered structure of the atmosphere and the fundamental properties of each layer. List the major components of the atmosphere and the fundamental properties of each layer. Discuss the concept of Air pressure and how it varies on Earth. Describe how heat energy affects the Earth’s atmosphere.</p> <p>In the World of Weather Unit, students will describe how air moves around the Earth. Describe the affect of water vapors on our weather. Measure water vapor and humidity. Discuss how air masses and air pressure affect weather predictions.</p>	Students Define various atmospheric vocabulary words. Students Define various weather vocabulary words. Students research and discuss global warming.
9–12	III. EARTH AND SPACE SCIENCE	C. The Universe	The student will relate the formation and components of our solar system to the conditions necessary for life.	<ol style="list-style-type: none"> <li>1. The student will explain how the sun, Earth and solar system formed.</li> <li>2. The student will compare the characteristics of Earth with the characteristics and movement patterns of the other planets, their satellites and other objects in our solar system.</li> <li>3. The student will compare and contrast the environmental parameters that make life possible on Earth with conditions found on the other planets of our solar system.</li> </ol>	In the Astronomy Unit, students will state how Earth’s motion affects the length of day and night. Discuss how Earth’s tilt on its axis affects our seasons. Discuss how Earth’s tides are related to its moon. Describe the Sun.	Students define various astronomy vocabulary words. Students research and discuss space exploration projects. Students research and discuss the Earth in comparison to another planet in our solar system.

Grade Level	Strand	Sub-Strand	Standard	Benchmarks	Curriculum	Assessment
9–12	III. EARTH AND SPACE SCIENCE	C. The Universe	The student will use astronomical data to reveal the structure, scale, and changes in the stars, galaxies and universe over time.	<ol style="list-style-type: none"> <li>1. The student will identify different types of stars and galaxies and describe how stars, galaxies and the universe change over time.</li> <li>2. The student will explain how nuclear fusion produces energy and other elements.</li> <li>3. The student will describe the evidence from current technologies that has been used to understand the composition and the early history of the universe.</li> <li>4. The student will explain how Doppler evidence indicates our universe is expanding in all directions.</li> </ol>	In the Astronomy Unit, students will state how Earth’s motion affects the length of day and night. Discuss how Earth’s tilt on its axis affects our seasons. Discuss how Earth’s tides are related to its moon. Describe the Sun.	Students define various astronomy vocabulary words.