

*Jemez Valley Public Schools*  
**INTEGRATED EARTH AND PHYSICAL SCIENCE • CONTENT MAP**

Quadrant I	Quadrant II	Quadrant III	Quadrant IV
<b>Strand I: Scientific Thinking and Practice</b>			
<b>Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.</b>			
<p>Describe the essential components of an investigation, including appropriate methodologies, proper equipment, and safety precautions.</p> <p>Design and conduct scientific investigations that include: testable hypotheses, controls and variables, results that address hypotheses being investigated, predictions based on results, and error analysis.</p> <p>Use appropriate technologies to collect, analyze, and communicate scientific data (e.g., balances, microscopes).</p> <p>Convey results of investigations using scientific concepts, methodologies, and expressions, including: scientific language and symbols, charts, and other data displays, clear, logical, and concise communication with reasoned arguments</p> <p>Understand how scientific processes produce valid, reliable results, including: consistency of explanations with data and observations, testability of hypotheses, repeatability of experiments and reproducibility of results.</p> <p>Create multiple displays of data to analyze and explain the relationships in scientific investigations.</p> <p>Identify and apply measurement techniques and consider possible effects of measurement errors.</p> <p>Design and conduct scientific investigations that include: methods to collect, analyze, and interpret data, re-evaluation of hypotheses and additional experimentation as necessary.</p> <p>Understand how scientific theories are used to explain and predict natural phenomena (e.g., plate tectonics, ocean currents, structure of atom).</p>	<p>Convey results of investigations using scientific concepts, methodologies, and expressions, including: mathematical expressions and processes (e.g., mean, median, slope, proportionality).</p> <p>Use appropriate technologies to collect, analyze, and communicate scientific data (e.g., computers, calculators).</p> <p>Use mathematical models to describe, explain, and predict natural phenomena.</p>	<p>Use technologies to quantify relationships in scientific hypotheses (e.g., calculators, computer spreadsheets and databases, graphing software, simulations, modeling).</p> <p>Understand how scientific processes produce valid, reliable results, including: openness to peer review, full disclosure and examination of assumptions.</p>	<p>Critically analyze an accepted explanation by reviewing current scientific knowledge.</p> <p>Examine investigations of current interest in science (e.g., superconductivity, molecular machines, age of the universe).</p> <p>Examine the scientific processes and logic used in investigations of past events (e.g., using data from crime scenes, fossils), investigations that can be planned in advance but are only done once (e.g., expensive or time-consuming experiments such as medical clinical trials), and investigations of phenomena that can be repeated easily and frequently.</p>

<i>Jemez Valley Public Schools</i>			
<b>INTEGRATED EARTH AND PHYSICAL SCIENCE • CONTENT MAP</b>			
Quadrant I	Quadrant II	Quadrant III	Quadrant IV
<b>Strand II: Content of Science</b>			
<b>Standard I: (Physical Science) Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</b>			
<p>Understand the scale and contents of the universe, including: range of structures from atoms through astronomical objects to the universe objects in the universe such as planets, stars, galaxies, and nebulae.</p> <p>Understand how knowledge about the universe comes from evidence collected from advanced technology (e.g., telescopes, satellites, images, computer models). Describe the key observations that led to the acceptance of the Big Bang theory and that the age of the universe is over 10 billion years</p> <p>Explain how objects in the universe emit different electromagnetic radiation and how this information is used.</p> <p>Describe how stars are powered by nuclear fusion, how luminosity and temperature indicate their age, and how stellar processes create heavier and stable elements that are found throughout the universe.</p> <p>Examine the role that New Mexico research facilities play in current space exploration (e.g., Very Large Array, Goddard Space Center).</p> <p>Understand that matter is made of atoms and that atoms are made of subatomic particles.</p> <p>Understand atomic structure, including (a) atom held together by proton-electron electrical forces, (b) nucleus made of protons and neutrons, (c) most space occupied by electrons, (d) masses of proton and neutron 2000 times greater than mass of electron, and (e) isotopes of an element</p> <p>Know that there are four fundamental forces in nature: gravitation, electromagnetism, weak nuclear force, and strong nuclear force.</p> <p>Know that each kind of atom or molecule</p>	<p>Predict changes in the positions and appearances of objects in the sky (e.g., moon, sun) based on knowledge of current positions and patterns of movements (e.g., lunar cycles, seasons)</p> <p>Understand that energy can change from one form to another (e.g., changes in kinetic and potential energy in a gravitational field, heats of reaction, hydroelectric dams) and know that energy is conserved in these changes</p> <p>Understand that the ability of energy to do something useful (work) tends to decrease (and never increases) as energy is converted from one form to another.</p> <p>Identify different forms of energy, including kinetic, gravitational (potential), chemical, thermal, nuclear, and electromagnetic.</p> <p>Explain how thermal energy (heat) consists of the random motion and vibrations of atoms and molecules and is measured by temperature.</p> <p>Understand how heat can be transferred by conduction, convection, and radiation, and how heat conduction differs in conductors and insulators.</p> <p>Describe relative motion using frames of reference.</p> <p>Represent the magnitude and direction of forces by vector diagrams.</p> <p>Apply Newton's Laws to describe and analyze the behavior of moving objects, including; (a) displacement, velocity, and acceleration of a moving object, (b) Newton's Second Law, <math>F = ma</math> (e.g., momentum and its conservation, the motion of an object falling under gravity, the independence of a falling object's motion on mass), and (c) circular motion and centripetal force.</p>	<p>Explain plate tectonic theory and understand the evidence that supports it.</p> <p>Know that Earth's systems are driven by internal (i.e., radioactive decay and gravitational energy) and external (i.e., the sun) sources of energy.</p> <p>Describe convection as the mechanism for moving heat energy from deep within Earth to the surface and discuss how this process results in plate tectonics, including; (a) geological manifestations (e.g., earthquakes, volcanoes, mountain building) that occur at plate boundaries and (b) impact of plate motions on societies and the environment (e.g., earthquakes, volcanoes).</p> <p>Describe wave propagation using amplitude, wavelength, frequency, and speed.</p> <p>Explain how the interactions of waves can result in interference, reflection, and refraction.</p> <p>Understand the relationship between force and pressure, and how the pressure of a volume of gas depends on the temperature and the amount of gas.</p> <p>Describe the characteristics and the evolution of Earth in terms of the geosphere, the hydrosphere, and the atmosphere.</p> <p>Describe the internal structure of Earth (e.g., core, mantle, crust) and the structure of Earth's plates.</p> <p>Explain how layers of the atmosphere (e.g., ozone, ionosphere) change naturally and artificially.</p> <p>Describe how waves are used for practical purposes (e.g., seismic data, and Doppler effect)</p>	<p>Know that materials containing equal amounts of positive and negative charges are electrically neutral, but that a small excess or deficit of negative charges produces significant electrical forces.</p> <p>Understand how the type and arrangement of atoms and their bonds determine macroscopic properties (e.g., boiling point, electrical conductivity, hardness of minerals).</p> <p>Describe the composition and structure of Earth's materials, including; (a) the major rock types (i.e., sedimentary, igneous, metamorphic) and their formation and (b) natural resources (e.g., minerals, petroleum) and their formation.</p>

<p>can gain or lose energy only in discrete amounts.</p> <p>Recognize that radiometric data indicate that Earth is at least 4 billion years old and that Earth has changed during that period.</p> <p>Understand the changes in Earth's past and the investigative methods used to determine geologic time, including: rock sequences, relative dating, fossil correlation, and radiometric dating; geologic time scales, historic changes in life forms, and the evidence for absolute ages (e.g., radiometric methods, tree rings, paleomagnetism).</p> <p>Describe trends in properties (e.g., ionization energy or reactivity as a function of location on the periodic table, boiling point of organic liquids as a function of molecular weight).</p> <p>Explain how electrons determine the properties of substances by; (a) interactions between atoms through transferring or sharing valence electrons, (b) ionic and covalent bonds, and (c) the ability of carbon to form a diverse array of organic structures.</p> <p>Know that some atomic nuclei can change, including (a) alpha, beta, and gamma radiation, (b) spontaneous decay, (c) half-life of isotopes, (d) fission, and (e) fusion (e.g., the sun)</p>	<p>Know that when one object exerts a force on a second object, the second object exerts a force of equal magnitude and in the opposite direction on the first object (i.e., Newton's Third Law).</p> <p>Know that every object exerts gravitational force on every other object, and how this force depends on the masses of the objects and the distance between them.</p>		
--	--	--	--