

Jemez Valley Public Schools
BIOLOGY • CONTENT MAP

Quadrant I	Quadrant II	Quadrant III	Quadrant IV
Strand I: Scientific Thinking and Practice			
Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.			
<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>Use scientific reasoning and valid logic to recognize: faulty logic, cause and effect, the difference between observation and unsubstantiated inferences and conclusions and potential bias.</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>

Understand how new data and observations can result in new scientific knowledge.			
Use mathematics to express and establish scientific relationships (e.g., scientific notation, vectors, dimensional analysis).			
Quadrant I	Quadrant II	Quadrant III	Quadrant IV
Strand II: Content of Science			
Standard I: (Physical Science) Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.			
Know that Earth's system contains a fixed amount of natural resources that cycle among land, water, the atmosphere, and living things (e.g., carbon and nitrogen cycles, rock cycle, water cycle, ground water, aquifers).			
Quadrant I	Quadrant II	Quadrant III	Quadrant IV
Strand II: Content of Science			
Standard I: (Life Science) Understand the properties, structures, and processes of living things and the interdependence of living things and their environments..			
<p>Know that an ecosystem is complex and may exhibit fluctuations around a steady state or may evolve over time.</p> <p>Describe how organisms cooperate and compete in ecosystems (e.g., producers, decomposers, herbivores, carnivores, omnivores, predator-prey, symbiosis, mutualism).</p> <p>Understand and describe how available resources limit the amount of life an ecosystem can support (e.g., energy, water, oxygen, nutrients).</p>	<p>Know that cells are made of proteins composed of combinations of amino acids.</p> <p>Know that specialized structures inside cells in most organisms carry out different functions, including: a cell and their functions (e.g., nucleus, chromosomes, plasma, and mitochondria), storage of genetic material in DNA, similarities and differences between plant and animal cells, prokaryotic and eukaryotic cells.</p> <p>Know how the cell membrane controls which ions and molecules enter and leave the cell based on membrane permeability and transport (i.e., osmosis, diffusion, active transport, passive transport).</p> <p>Explain how cells differentiate and specialize during the growth of an organism, including: differentiation, regulated through the selected expression of different genes, specialized cells, response to stimuli (e.g., nerve cells, sense organs).</p> <p>Describe how most cell functions involve chemical reactions, including: promotion or inhibition of biochemical reactions by enzymes, processes of respiration (e.g., energy production, ATP), communication from cell to cell by secretion of a variety of chemicals (e.g., hormones).</p> <p>Describe the mechanisms for cellular processes (e.g., energy production and</p>	<p>Know how DNA carries all genetic information in the units of heredity called genes, including: the structure of DNA (e.g., subunits A, G, C, T), information-preserving replication of DNA, alteration of genes by inserting, deleting, or substituting parts of DNA.</p> <p>Use appropriate vocabulary to describe inheritable traits (i.e., genotype, phenotype).</p> <p>Explain the concepts of segregation, independent assortment, and dominant/recessive alleles.</p> <p>Know how genetic variability results from the recombination and mutation of genes, including: sorting and recombination of genes in sexual reproduction result in a change in DNA that is passed on to offspring, radiation or chemical substances can cause mutations in cells, resulting in a permanent change in DNA</p>	<p>Understand variation within and among species including: mutations and genetic drift, factors affecting the survival of an organism, natural selection.</p> <p>Explain how natural selection favors individuals who are better able to survive, reproduce and leave offspring.</p> <p>Analyze how evolution by natural selection and other mechanisms explains many phenomena including the fossil record of ancient life forms and similarities (both physical and molecular) among different species.</p> <p>Describe the evidence for the first appearance of life on Earth as one-celled organisms, over 3.5 billion years ago, and for the later appearance of a diversity of multicellular organisms over millions of years.</p> <p>Critically analyze the data and observations supporting the conclusion that the species living on Earth today are related by descent from the ancestral one-celled organisms.</p> <p>Understand the data, observations, and logic supporting the conclusion that species today evolved from earlier, distinctly different species, originating from the ancestral one-celled organisms.</p> <p>Understand that evolution is a consequence of many factors, including</p>

	<p>storage, transport of molecules, waste disposal, synthesis of new molecules).</p> <p>Understand and explain the principles of photosynthesis (i.e., chloroplasts in plants convert light energy, carbon dioxide, and water into chemical energy).</p> <p>Understand the principles of sexual and asexual reproduction, including meiosis and mitosis.</p> <p>Know that most cells in the human body contain 23 pairs of chromosomes including one pair that determines sex, and that human females have two X chromosomes and human males have an X and a Y chromosome.</p>		<p>the ability of organisms to reproduce, genetic variability, the effect of limited resources, and natural selection.</p> <p>Understand and explain the hierarchical classification scheme (i.e., domain, kingdom, phylum, class, order, family, genus, species), including: classification of an organism into a category, similarity inferred from molecular structure (DNA) closely matching classification based on anatomical similarities, similarities of organisms reflecting evolutionary relationships.</p>
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Quadrant I	Quadrant II	Quadrant III	Quadrant IV
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Strand II: Content of Science
Standard III: (Earth and Space Science) Understand the structure of Earth, the solar system, and the universe, the interconnections among them, and the processes and interactions of Earth's systems.

<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 the patterns and relationships in the circulation of air and water driven by the sun's radiant energy, including; (a) patterns in weather systems related to the transfer of energy, (b) differences between climate and weather, (c) global climate, global warming, and the greenhouse effect, and (d) El Niño, La Niña, and other climatic trends.</p> <p>Know that Earth's system contains a fixed amount of natural resources that cycle among land, water, the atmosphere, and living things (e.g., carbon and nitrogen cycles, rock cycle, water cycle, ground water, aquifers).</p> <p>Explain how the availability of ground water through aquifers can fluctuate based on multiple factors (i.e., rate of use, rate of replenishment, surface changes, and changes in temperature).</p>			<p>Describe the characteristics and the evolution of Earth in terms of the geosphere, the hydrosphere, the atmosphere, and the biosphere.</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 (a) rock sequences (b) relative dating (c) fossil correlation and radiometric dating, (d) geologic time scales, historic changes in life forms, and (e) and the evidence for absolute ages (e.g., radiometric methods, tree rings, paleomagnetism)</p>
Quadrant I	Quadrant II	Quadrant III	Quadrant IV

Strand II: Science and Society
Standard I: Understand how scientific discoveries, inventions, practices, and knowledge influence, and are influenced by, individuals and societies.

<p>Describe how human activities have affected ozone in the upper atmosphere and how it affects health and the environment.</p> <p>Analyze the impact of digital technologies on the availability, creation, and dissemination of information.</p> <p>Describe how scientific knowledge helps decision makers with local, national, and global challenges (e.g., Waste Isolation Pilot Project [WIPP], mining, drought, population growth, alternative energy, climate change).</p> <p>Explain how societies can change ecosystems and how these changes can be reversible or irreversible.</p> <p>Describe how environmental, economic, and political interests impact resource management and use in New Mexico.</p>	<p>Understand how advances in technology enable further advances in science (e.g., microscopes and cellular structure; telescopes and understanding of the universe)</p>	<p>Know that societal factors can promote or constrain scientific discovery (e.g., government funding, laws and regulations about human cloning and genetically modified organisms, gender and ethnic bias, AIDS research, alternative-energy research). Understand the scientific foundations of common technologies (e.g., kitchen appliances, radio, television, aircraft, rockets, computers, medical X-rays, selective breeding, fertilizers and pesticides, agricultural equipment).</p> <p>Understand that scientists have characteristics in common with other individuals (e.g., employment and career needs, curiosity, desire to perform public service, greed, preconceptions and biases, temptation to be unethical, core values including honesty and openness).</p> <p>Understand that applications of genetics can meet human needs and can create new problems (e.g., agriculture, medicine, cloning).</p>	<p>Evaluate the influences of technology on society (e.g., communications, petroleum, transportation, nuclear energy, computers, medicine, genetic engineering) including both desired and undesired effects, and including some historical examples (e.g., the wheel, the plow, the printing press, the lightning rod).</p> <p>Know how science enables technology but also constrains it, and recognize the difference between real technology and science fiction (e.g., rockets vs. antigravity machines; nuclear reactors vs. perpetual motion machines; medical X-rays vs. Star-Trek tricorders)</p> <p>Describe major historical changes in scientific perspectives (e.g., atomic theory, germs, cosmology, relativity, plate tectonics, evolution) and the experimental observations that triggered them.</p> <p>Understand that reasonable people may disagree about some issues that are of interest to both science and religion (e.g., the origin of life on Earth, the cause of the Big Bang, the future of Earth).</p> <p>Identify important questions that science cannot answer (e.g., questions that are beyond today's science, decisions that science can only help to make, questions that are inherently outside of the realm of science).</p>
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