

APS DISTRICT HIGH SCHOOL SCIENCE CURRICULUM FRAMEWORK

Course Title: Marine Science Course Number: 43151

Department: Science ADS Number: 17714144

Prerequisites: None

Length of Course: One Year Credit/PRI Area: .50 per Sem/Science Grade Level(s): 9-12

Important Notes:

COURSE DESCRIPTION: This laboratory course* is designed to provide an overview on the marine environment. The student conducts field and laboratory investigations, uses scientific methods during investigations, and makes informed decisions using critical thinking and scientific problem-solving skills. The student examines topics to include, but not limited to, the nature of science, the origins of the ocean, the chemical, physical, and geographic aspects of the marine environment, the ecology of various sea zones, the diversity of marine organisms, characteristics of marine ecosystems, and the interrelationship between humans and the oceans. Literacy strategies are integrated throughout the curriculum.

* Lab Courses: A minimum of 250 minutes per week of directed class activity for 36 weeks, 40% of which must be lab oriented, for a total of 150 clock hours (90 hours of class plus 60 hours of lab) shall be required for one (1) unit of credit, excluding passing period. [APS Procedural Directives, Section I – Instruction, Basis for offering credit].

References in parentheses following each performance standard align with the State of New Mexico Science Standards (NM) and the Albuquerque Public Schools Language Arts Standards (APS - LA).

STRATEGIES:

The “Illustrations” column in the *Program of Studies* provides exemplars of the performance standards, strategies, and best practices suggested by science teachers in the Albuquerque Public Schools (APS).

ASSESSMENTS:

Assessments may include the following: authentic and performance-based assessment, cooperative learning, teacher observations, checklists, tests and exams, formal and informal writing, small group and full class discussions, oral and multimedia presentations, projects, demonstrations, and portfolios. Assessments are based on appropriate rubrics.

SUGGESTED TEXTBOOKS AND INSTRUCTIONAL MATERIALS:

- *Marine Biology: An Ecological Approach* - James W. Nybakken - Pearson Education - 5th edition - 2000
- *Sealife: A Complete Guide to the Marine Environment* - Geoffrey Waller, Marc Dando, Richard Hull, Michael Burchett - Smithsonian Books - 1996

SUGGESTED TITLES/AUTHORS WEB SITES:

- <http://www.worldbestwebsites.com/science.htm>
- <http://webs.cmich.edu/resgi>
- <http://hometown.aol.com/newjerseymeaa/topten.html>
- <http://www.library.auckland.ac.nz/subjects/marine/marmeta.html>

Links to some of the best science and technology web sites.

Organized alphabetically around the sequence of topics typically taught in an introductory earth science or physical geography class.

NJMEA’s The Top Ten Marine Science Sites On The World Wide Web.

Contains a combined list of links to datasets, web sites, and resources on the Internet which will be of interest to marine scientists.

Approved by HSCA: 12/04

STRAND I: SCIENTIFIC THINKING AND PRACTICE

CONTENT STANDARD: The student understands the processes of scientific investigations and uses inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.

- BENCHMARKS:**
- A. The student uses accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicates results.
 - B. The student understands that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected.
 - C. The student uses mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions.

GRADE 9-12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>1. Describes the essential components of an investigation, including appropriate methodologies, proper equipment, and safety precautions (NM - I.I.I.1).</p>	<p>NOTE: Illustrations include suggested activities for attaining each performance standard. A check (✓) refers to a key feature to look for while assessing student performance.</p> <p>1-10. The student examines how underwater scientists stay in one place to conduct his/her work by conducting an experiment on underwater physics. The student follows directions, answers questions, and records them in an organized manner (www.uncw.edu/nurc/aquarius). The student participates in an interactive class discussion on the process and results of the experiment.</p> <ul style="list-style-type: none">✓ correctly following directions✓ correct answers to questions✓ notes on the hypothesis, experiment, observations, and conclusion✓ group participation in the discussion <p>1-11. See Strand III, Illustration set 1,3.</p> <p>1 – 4, 6 – 16. The student listens to or participates in a physics demonstration or properly designs and performs a controlled experiment using a recognized scientific method. He/She gathers data, and reports results in both an oral and written format.</p> <ul style="list-style-type: none">✓ proper safety techniques✓ correct use of equipment✓ appropriate equipment✓ evidence of current scientific knowledge✓ effective communication skills✓ use of technology✓ quantitative data✓ critical thinking and insight

GRADE 9-12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>2. Designs and conducts scientific investigations that include (NM - I.I.I.2):</p> <ul style="list-style-type: none"> • testable hypotheses, • controls and variables, • methods to collect, analyze, and interpret data, • results that address hypotheses being investigated, • predictions based on results, • re-evaluation of hypotheses and additional experimentation as necessary, and • error analysis. <p>3. Uses appropriate technologies to collect, analyze, and communicate scientific data (e.g., computers, calculators, balances, microscopes) (NM - I.I.I.3).</p> <p>4. Conveys results of investigations using scientific concepts, methodologies, and expressions, including (NM - I.I.I.4):</p> <ul style="list-style-type: none"> • scientific language and symbols, • diagrams, charts, and other data displays, • mathematical expressions and processes (e.g., mean, median, slope, proportionality), • clear, logical, and concise communication, and • reasoned arguments. <p>5. Understands how scientific theories are used to explain and predict natural phenomena (e.g., plate tectonics, ocean currents, structure of atoms) (NM - I.I.I.5).</p> <p>6. Understands how scientific processes produce valid, reliable results, including (NM - I.I.II.1):</p> <ul style="list-style-type: none"> • consistency of explanations with data and observations, • openness to peer review, • full disclosure and examination of assumptions, • testability of hypotheses, and • repeatability of experiments and reproducibility of results. 	<p>1, 3-6, 8. See Stand III, Illustration set 1, 3.</p> <p>2-6, 8-16. Using the essential components of investigating, designing, and conducting an experiment, the student plants sea grasses in tanks with various conditions (e.g., variations in temperature, salinity or light) to see which way they thrive the best.</p> <ul style="list-style-type: none"> ✓ experimental questions ✓ hypothesis ✓ plan of experiment ✓ observations ✓ results ✓ conclusions <p>5. The student examines scientific theories by viewing, applying, or participating in demonstrations or labs.</p> <ul style="list-style-type: none"> ✓ organization of data ✓ data supports theory ✓ critical thinking/insights ✓ defense of argument ✓ clear communication ✓ graphic organizers

GRADE 9-12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>7. Uses scientific reasoning and valid logic to recognize (NM - I.I.II.2):</p> <ul style="list-style-type: none"> • faulty logic, • cause and effect, • the difference between observation and unsubstantiated inferences and conclusions, and • potential bias. <p>8. Understands how new data and observations can result in new scientific knowledge (NM - I.I.II.3).</p> <p>9. Critically analyzes an accepted explanation by reviewing current scientific knowledge (NM - I.I.II.4).</p> <p>10. Examines investigations of current interest in science (e.g., superconductivity, molecular machines, age of the universe) (NM - I.I.II.5).</p> <p>11. Examines 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 (NM - I.I.II.6).</p> <p>12. Creates multiple displays of data to analyze and explain the relationships in scientific investigations (NM - I.I.III.1).</p> <p>13. Uses mathematical models to describe, explain, and predict natural phenomena (NM - I.I.III.2).</p> <p>14. Uses technologies to quantify relationships in scientific hypotheses (e.g., calculators, computer spreadsheets and databases, graphing software, simulations, modeling) (NM - I.I.III.3).</p> <p>15. Identifies and applies measurement techniques and considers possible effects of measurement errors (NM - I.I.III.4).</p> <p>16. Uses mathematics to express and establish scientific relationships (e.g., scientific notation, vectors, dimensional analysis) (NM - I.I.III.5).</p>	<p>8-16. See Strand II, Illustration set 2, 10, 14-16.</p> <p>9-11. See Strand V, Illustration set 1, 3, 6, 7.</p>

STRAND II: THE CONTENT OF SCIENCE-PHYSICAL SCIENCE

CONTENT STANDARD: The student understands the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.

BENCHMARKS: A. The student understands the transformation and transmission of energy and how energy and matter interact.

B. The student understands the motion of objects and waves, and the forces that cause them.

GRADE 9-12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>1. Understands how heat can be transferred by conduction, convection, and radiation, and how heat conduction differs in conductors and insulators (NM - II.I.II.4).</p> <p>2. Understands 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 (NM - II.I.II.6).</p>	<p>NOTE: The student participates in hands-on activities directed towards an understanding of performance standards. After each activity the student submits a written summary and/or participates in a discussion relevant to that activity.</p> <ul style="list-style-type: none">✓ conceptual understanding✓ accuracy✓ error analysis✓ accurate conclusion <p>1, 4. Greenhouse Gas Experiment The student examines the cause and effect of the greenhouse effect by generating a sample of carbon dioxide and examining the properties of carbon dioxide as a factor in global warming. He/She collects data on mass, volume, and temperatures and then verifies the temperature data with liquid crystals as an optical verification.</p> <ul style="list-style-type: none">✓ accurate observations✓ correctly recorded data in tabular form and presented on a graph✓ verification of the presence of gas✓ information management skills <p>2, 10, 14-16. Dynamics of Plate Tectonics: Earthquakes The student under teacher supervision visits an online interactive earthquake simulation web site (e.g., Virtual Earthquake Site at http://64.239.9.13/VirtualEarthquake). He/She uses scientific tools and methods to determine important information about an earthquake. As the student explores the interactive earthquake site, he/she completes the required steps and problems, and responds to the questions about seismic waves (S and P), S-P intervals, magnitudes in a Richter scale, amplitudes, and other information found on the seismogram.</p> <ul style="list-style-type: none">✓ application of vocabulary✓ correct response to questions✓ observance of the steps in the simulation

<p>3. Understands that electromagnetic waves carry energy that can be transferred when they interact with matter (NM - II.I.II.7).</p> <p>4. Understands the concept of equilibrium (i.e., thermal, mechanical, and chemical) (NM - II.I.II.11).</p> <p>5. Knows that there are four fundamental forces in nature: gravitation, electromagnetism, weak nuclear force, and strong nuclear force (NM - II.I.III.1).</p> <p>6. Knows 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 (NM - II.I.III.2).</p> <p>7. Knows 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 (NM - II.I.III.3).</p> <p>8. Understands the relationship between force and pressure, and how the pressure of a volume of gas depends on the temperature and the amount of gas (NM - II.I.III.4).</p> <p>9. Explains how electric currents cause magnetism and how changing magnetic fields produce electricity (e.g., electric motors, generators) (NM - II.I.III.5).</p> <p>10. Represents the magnitude and direction of forces by vector diagrams (NM - II.I.III.6).</p> <p>11. Knows 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) (NM - II.I.III.7).</p> <p>12. Applies Newton's Laws to describe and analyze the behavior of moving objects, including (NM - II.I.III.8):</p> <ul style="list-style-type: none"> • displacement, velocity, and acceleration of a moving object, • Newton's Second Law, $F = ma$ (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 	<p>3, 5, 6, 8, 11-13. The student refers to images taken by the Hubble space telescope of stars in different stages of development. The student joins a team to do research on a star's life. Each team focuses on one aspect of the stellar evolution of a particular star (e.g., protostar, middle normal star, dying stage, end state). The team reports its findings, using a visual (e.g., a poster, photograph, PowerPoint presentation). After each team's report, the team members lead a whole-class discussion on what could be inferred about earlier and later star development based on the team's information about a star's stellar evolution. After all the presentations are completed, the students as a group respond to the statement: Explain how Einstein's famous equation, $E=mc^2$ relates to the sun's energy production. Describe what you think would happen if all the sun's mass were instantly converted to energy.</p> <ul style="list-style-type: none"> ✓ well researched report ✓ organization, logic, and clarity of information ✓ an interesting and lively presentation ✓ well organized discussion <p>7, 9. Electricity and Magnetism</p> <p>Using a magnet, the student induces the flow of electricity and utilizes the galvanometer to measure its flow. The student coils a wire big enough to allow the bar magnet to pass through and hooks the bare ends of the wire to the galvanometer. He/She passes the bar magnet through the coils in a back and forth motion slowly, then quickly. The induced flow of electricity causes the needle on the galvanometer to move.</p> <ul style="list-style-type: none"> ✓ understanding of the concept of electrical forces ✓ understanding of the relationship between electric currents and magnetism
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	<ul style="list-style-type: none">• circular motion and centripetal force. <ol style="list-style-type: none">13. Describes relative motion using frames of reference (NM - II.I.III.9).14. Describes wave propagation using amplitude, wavelength, frequency, and speed (NM - II.I.III.10).15. Explains how the interactions of waves can result in interference, reflection, and refraction (NM - II.I.III.11).16. Describes how waves are used for practical purposes (e.g., seismic data, acoustic effects, Doppler effects) (NM - II.I.III.12).	
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STRAND III: THE CONTENT OF SCIENCE-EARTH AND SPACE

CONTENT STANDARD: The student understands the structure of Earth, the solar system, and the universe, the interconnections among them, and the processes and interactions of Earth's systems.

BENCHMARKS: A. The student examines the scientific theories of the origin, structure, contents, and evolution of the solar system and the universe, and their interconnections.

B. The student examines the scientific theories of the origin, structure, energy, and evolution of Earth and its atmosphere, and their interconnections.

GRADE 9-12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>1. Understands the scale and contents of the universe, including (NM - II.III.1.1):</p> <ul style="list-style-type: none">• range of structures from atoms through astronomical objects to the universe, and• objects in the universe such as planets, stars, galaxies, and nebulae.	<p>1-10. The student participates in computer animation and hands-on activities directed towards an understanding of astronomical relationships between the marine environment and our solar system.</p> <ul style="list-style-type: none">✓ conceptual understanding✓ accuracy✓ error analysis✓ accurate conclusion <p>1, 3. The student visits http://cse.ssl.berkeley.edu/SegwayEd/lessons/boss/student1.html to look at images of the planets and the moon. The student writes the image number and records his/her observations in a journal. Like a scientist the student adds information as he/she learns it from other students' observations but cannot change the information first observed. The student takes notes on other students' observations and adds those to his/her notes. (See pre-activity in Strand IV, Illustration set 2, 3, 6).</p> <p>Questions:</p> <ol style="list-style-type: none">What does the image actually show?What visual characteristics will help you recognize this planet?What else would you like to know about the planet or special features shown on the image? <p>In a short paragraph write a detailed description of what you can see in the image – all physical characteristics (e.g., textures, solid, liquid, gas)- and then write down your best guess of what planet or moon you are looking at or the specific kind of features you may be observing (e.g., volcano, river).</p> <ul style="list-style-type: none">✓ accurate responses to questions✓ recorded observations✓ group participation in all activities✓ completion of writing assignment using conventions

	<p>2. Predicts 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) (NM - II.III.I.2).</p> <p>3. Understands how knowledge about the universe comes from evidence collected from advanced technology (e.g., telescopes, satellites, images, computer models) (NM - II.III.I.3).</p>	<p>1, 3, 5, 8, 9. The student refers to images taken by the Hubble space telescope of stars in different stages of development. The student joins a team to do research on a star's life. Each team focuses on one aspect of the stellar evolution of a particular star (e.g., protostar, middle normal star, dying stage, end state). The team reports its findings using a visual (e.g., poster, photograph, PowerPoint presentation). After each team's report, the team members lead a whole-class discussion on what could be inferred about earlier and later star development based on the team's information about a star's stellar evolution. After all the presentations are completed, the students as a group respond to the statement: Explain how Einstein's famous equation, $E=mc^2$ relates to the sun's energy production. Describe what you think would happen if all the sun's mass were instantly converted to energy.</p> <ul style="list-style-type: none"> ✓ report that is well researched ✓ information clearly and logically organized ✓ presentation interesting and lively ✓ discussion well organized <p>1, 4. The student reviews a timeline of the universe beginning with the Big Bang theory to learn when the galaxy, sun, and Earth formed. Before viewing the information, the student imagines the Universe as compressed into one single year beginning with the current time for the moment the clock strikes midnight on New Year's Eve. The student predicts when certain events would have occurred if the Big Bang happened on New Year's Day (e.g., In what month did the sun form? In what month would the first planet appear? How many months or days would the dinosaurs roam the Earth?). After viewing the calendar, the student responds to the question, What events and dates surprised them most? The student estimates what the Earth in one year might look like with the formation of Earth on January 12.</p> <ul style="list-style-type: none"> ✓ understanding of the Big Bang theory ✓ understanding the history of the universe <p>Reference: http://school.discovery.com/schooladventures/universe/itsawesome/cosmiccalendar/page2.html</p> <p>2. View From Satellite. The student visits: http://www.fourmilab.ch/earthview/vplanet.html to view the Earth as currently seen from a satellite of his/her choice in Earth's orbit. The student views either a map of the Earth showing the day and night regions at this moment, or views the Earth from the sun, the moon, the night side of the Earth, above any location on the planet specified by latitude, longitude and altitude, a satellite in Earth's orbit, or above</p>
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<p>4. Describes 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 (NM - II.III.I.4).</p> <p>5. Explains how objects in the universe emit different electromagnetic radiation and how this information is used (NM - II.III.I.5).</p> <p>6. Examines the role that New Mexico research facilities play in current space exploration (e.g., Very Large Array, Goddard Space Center) (NM - II.III.I.7).</p> <p>7. Explains plate tectonic theory and understands the evidence that supports it (NM - II.III.II.5).</p> <p>8. Describes 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 (NM - II.III.I.6).</p> <p>9. Knows that Earth's systems are driven by internal (i.e., radioactive decay and gravitational energy) and external (i.e., the sun) sources of energy (NM - II.III.II.6).</p> <p>10. Describes convection as the mechanism for moving heat energy from deep within Earth to the surface and discusses how this process results in plate tectonics, including (NM - II.III.II.7):</p> <ul style="list-style-type: none"> • geological manifestations (e.g., earthquakes, volcanoes, mountains buildings) that occur at plate boundaries, and • impact of plate motions on societies and the environment (e.g., earthquakes, volcanoes). 	<p>various cities around the globe. In addition to the Earth, the student views the moon from the Earth, sun, night side, above named formations on the lunar surface or as a map showing day and night. The student formulates questions and provides answers or writes brief observations of what he/she sees.</p> <ul style="list-style-type: none"> ✓ observations ✓ questions and answers sheet <p>6. Web Quest The student embarks upon a teacher-directed web quest to research and write a report on the role New Mexico played or currently plays in space exploration.</p> <ul style="list-style-type: none"> ✓ understanding of the task ✓ adherence to the process ✓ summary of research ✓ list of links ✓ clear communication <p>7, 9, 10. The student examines plate theory, manifestations and impact of plate motion by researching, graphing, and analyzing volcanism, topography, and seismicity for various sites and boundaries. Re: http://www.gsw.edu/~daskren/plates/ptlab.html http://www.pbs.org/wgbh/aso/tryit/tectonics/#</p> <ul style="list-style-type: none"> ✓ understanding of plate tectonic theory ✓ concept of heat convection ✓ accurate graph representations <p>8. See Strand II, Illustration set 3, 5, 6, 8, 11-13.</p>
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STRAND IV: SCIENCE AND SOCIETY**CONTENT STANDARD:** The student understands how scientific discoveries, inventions, practices, and knowledge influence, and are influenced by, individuals and societies.**BENCHMARK:** The student examines and analyzes how scientific discoveries and their applications affect the world, and explains how societies influence scientific investigations and applications.

GRADE 9-12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>1. Knows how science enables technology but also constrains it, and recognizes 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) (NM - III.I.1).</p> <p>2. Understands how advances in technology enable further advances in science (e.g., microscopes and cellular structure, telescopes and understanding of the universe) (NM - III.I.2).</p>	<p>1. The student views video clips and critically assesses each for scientific theory based in a water environment, applying knowledge of marine science. He/She clarifies misconceptions typically associated with fictional movies loosely based on scientific phenomena. While watching the clip, the student completes a viewing log citing scenes throughout the movie by doing the following:</p> <ul style="list-style-type: none"> • briefly describing a scene in the movie • citing the mythical science phenomenon/phenomena observed • explaining the true science phenomenon/phenomena • recording their observation/opinion of the scene's scientific accuracy <p>The student shares his/her observations, or with other students he/she collates the responses (combining like observations) and researches the scientific accuracy or validity of science phenomenon/phenomena. The large groups reconvene to present their findings to the classroom.</p> <ul style="list-style-type: none"> ✓ comparison of their understanding or preconception of the science concept ✓ description of the phenomena portrayed in the movie ✓ explanation of the phenomena/effects shown ✓ research conventions (e.g., note cards, outlining, citations) <p>2-4, 6. The student researches a particular technological item or scientific discovery relevant to marine science and either orally or in written format presents the origin of that item, changes based on technology or discovery, and the pros and cons of the development.</p> <ul style="list-style-type: none"> ✓ research conventions ✓ completion of components ✓ accuracy ✓ analysis and organization ✓ effective presentation

GRADE 9-12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>3. Evaluates 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) (NM - III.I.1.3).</p> <p>4. Understands 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) (NM - III.I.1.4).</p> <p>5. Understands that applications of genetics can meet human needs and can create new problems (e.g., agriculture, medicine, cloning) (NM - III.I.1.5).</p> <p>6. Analyzes the impact of digital technologies on the availability, creation, and dissemination of information (NM - III.I.1.6).</p> <p>7. Describes how human activities have affected ozone in the upper atmosphere and how it affects health and the environment (NM - III.I.1.7).</p> <p>8. Describes uses of radioactivity (e.g., nuclear power, nuclear medicine, radiometric dating) (NM - III.I.1.8).</p> <p>9. Describes 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] (NM - III.I.1.9).</p> <p>10. Describes major historical changes in scientific perspectives (e.g., atomic theory, germs, cosmology, relativity, plate tectonics, evolution) and the experimental observations that triggered them (NM - III.I.1.10).</p>	<p>3, 5, 8, 10, 11, 15. The Effects of Radiation on Growth The student researches (e.g., internet) irradiated food on the Internet and presents his/her findings to the class. The student joins a team and develops a question to research. The group presents the information by using clear notes/diagrams and answering student questions. The student takes notes on other presentations.</p> <p>Resources:</p> <ul style="list-style-type: none"> • www.ConsumerReports.org • www.graystarinc.com/genesis.html • www.cdc.gov/ncidod/dbmd/diseaseinfo/foodirradiation.htm • www.epa.gov/rpdweb00/rrpage/sources/foodsafety.htm • www.epa.gov/radiation/surces/foodirrad.htm <ul style="list-style-type: none"> ✓ use of research practices (e.g., note taking, outlining, work citations, bibliography) ✓ writing and speaking conventions ✓ notes from other groups ✓ essential questions and answers <p>7. The student participates in a brainstorming session on what student activities have affected the ozone and how each activity affects the health and environment. The student chooses one activity and suggests ways he/she and the immediate members of the class can reduce the use of the activity. The student presents the suggestion (e.g., poster, PowerPoint presentation).</p> <ul style="list-style-type: none"> ✓ participation in class discussions ✓ accurate information on human causes of ozone depletion ✓ appropriate suggestions to lesson effects ✓ effective presentation <p>9, 12- 14, 17-19. The student listens to a guest speaker (e.g., someone from Sandia Labs, PNM) talk about local environmental issues (e.g., What are the issues associated with processing and/or storing nuclear waste? What are the considerations of alternate energy sources?). After the lecture the student develops an action plan that deals with a particular school environment problem (e.g., conservation of water). The plan must outline specifically what is to be done, how the plan affects the problem, and the benefits of the plan.</p> <ul style="list-style-type: none"> ✓ understanding of an issue ✓ viability of plan ✓ specifics ✓ problem solving

GRADE 9-12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>11. Knows 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) (NM - III.I.I.11).</p> <p>12. Explains how societies can change ecosystems and how these changes can be reversible or irreversible (NM - III.I.I.12).</p> <p>13. Describes how environmental, economic, and political interests impact resource management and use in New Mexico (NM - III.I.I.13).</p> <p>14. Describes New Mexico’s role in nuclear science (e.g., Manhattan Project, WIPP, National Laboratories) (NM - III.I.I.14).</p> <p>15. Identifies how science has produced knowledge that is relevant to individual health and material prosperity (NM - III.I.I.15).</p> <p>16. Understands 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) (NM - III.I.I.16).</p> <p>17. Identifies 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) (NM - III.I.I.17).</p> <p>18. Understands 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) (NM - III.I.I.18).</p>	<p>12. As a member of a team, the student simulates his/her own very limited environment disaster (http://www.vims.edu/bridge/pollution.html).</p> <ul style="list-style-type: none"> ✓ completion of all activities ✓ understanding of pollution issues ✓ cost of pollution cleanup ✓ implications of pollution on the environment <p>16, 17. See Strand V, Illustration set 1, 3, 6, 7.</p> <p>18, 19. Integrated consistently in the curriculum throughout the year is the career connection. Current textbooks interject the “real-life” aspect and applications in almost every chapter, and the instructor takes every opportunity to insert that in, whether it be through personal experiences or through questioning (e.g., What does a technician do? What is a physicist?). The student talks about his personal career interest and explains where science is used in this career (e.g., mechanics, vet, park ranger).</p> <p style="text-align: center;">OR</p>

GRADE 9-12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>19. Knows that science plays a role in many different kinds of careers and activities (e.g., public service, volunteers, public office holders, researchers, teachers, doctors, nurses, technicians, farmers, ranchers) (NM - III.I.19).</p>	<p>Either as a school-wide project, or class project, the student participates in a Career Day Fair. The student listens to a variety of speakers (e.g., engineer, technician, physicist, research scientist) in the science field talk about aspects of their jobs. After the fair the student in either oral or written format summarizes one career.</p> <ul style="list-style-type: none"> ✓ individual participation ✓ listening skills ✓ personal connections

STRAND V: LITERACY**CONTENT STANDARD:** The student communicates marine principles through reading, writing, and speaking opportunities.**BENCHMARK:** The student demonstrates proficiency in reading comprehension, specialized vocabulary, and a variety of writing and speaking requirements.

GRADE 9-12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>1. Develops and demonstrates proficiency with the following strategies to approach reading for information across content areas (APSLA I.1)</p> <ul style="list-style-type: none"> • scans reading selection to determine whether a text contains relevant information, • uses the headings and subheadings of the material to make predictions and to validate comprehension of text, • reads and rereads to decode meaning, and • reviews and summarizes essential elements of text for overview. 	<p>1, 3-5, 7, 10. The student surfs and visits useful science web sites and writes a description of the content of each one. He/She visits enough of the site to describe what the entire site is about, not just the home page. The descriptions should be brief - a paragraph for each site - but must include the following:</p> <p>1). a general description of the website and 2). at least one example of something learned from the website.</p> <ul style="list-style-type: none"> ✓ understanding of the task ✓ adherence to the process ✓ summary of research ✓ list of links <p>1, 3, 6, 7. The student selects and reviews a series of current science articles from an appropriate science journal or teacher-approved website and follows the steps outlined below.</p> <p>Step 1:</p> <ul style="list-style-type: none"> • Identify the author and locate any biographical information that provides insight into who he/she is. • What perspective does the author bring to the book (e.g., university professor, expert in the field, classroom educator)? <p>Step 2: Read the article and take notes.</p> <p>Step 3: Write a 50-70-word summary including why the article is interesting, important, or controversial in nature and provides his/her opinion on the topic.</p> <ul style="list-style-type: none"> ✓ completion of the steps ✓ proper use of referencing author's thoughts ✓ use of bibliographic format for each article <p>(Based on <i>Questioning The Author: An Approach For Enhancing Student Engagement With Text</i> by I. Beck, et. al., International Reading Association, Newark, DE)</p>

GRADE 9-12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>2. Identifies and uses roots, prefixes, and suffixes to determine meaning of words (APSLA I.4).</p> <p>3. Uses textual evidence to develop and support an interpretation of a scientific process or concept (APSLA II.2).</p> <p>4. Develops increased competence in using the writing process to create a final product (APSLA III.1).</p> <p>5. Develops increased competence in using elements of effective writing (APSLA III.2).</p> <p>6. Supports an informed opinion (APSLA III.6):</p> <ul style="list-style-type: none"> • uses appropriate language, reasoning, and organizational structure for the audience and purpose, • provides relevant and convincing reasons, uses various types of evidence, and • demonstrates an awareness of possible questions, concerns, or counterarguments. <p>7. Responds to a variety of written, electronic, and other media (APSLA III.7).</p> <p>8. Develops increased competence with speaking and language conventions (APS – LA IV.3).</p> <p>9. Listens to and analyzes a presentation or discussion (APSLA V.1).</p> <p>10. Uses a variety of technology for a variety of purposes (APSLA-VI.5).</p>	<p>1, 4, 5, 7, 10. Web Quest The student embarks upon a teacher-directed web quest to research, run online simulations, and write a report. The student determines the topic, researches, and presents findings in a report format.</p> <ul style="list-style-type: none"> ✓ understanding of the task ✓ adherence to the process ✓ summary of research ✓ list of links ✓ effective communication <p>2. The student maintains a dictionary of important scientific terms including etymology.</p> <ul style="list-style-type: none"> ✓ continual maintenance of dictionary ✓ correct information <p>4, 5. The student writes extensions of labs or demonstrations presented in Strands II and III.</p> <ul style="list-style-type: none"> ✓ conceptual understanding ✓ lab writing process ✓ logical organization <p>8, 9. The student participates in small and large group discussions on investigations, demonstrations, and experiments completed in class.</p> <ul style="list-style-type: none"> ✓ demonstration of appropriate participation in group discussions (e.g., takes turns, solicits another person’s opinion, responds to comments and questions, takes a role in the group)