APS DISTRICT HIGH SCHOOL SCIENCE CURRICULUM FRAMEWORK

Course Title: Botany **Course Number:** SEE BELOW

Department: Science **ADS Number:** SEE BELOW

Prerequisites: None

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

COURSE AND ADS NUMBERS:

Botany	41141	17114144
Botany Bilingual	4114B	17118144
Botany	060MG	17112144
Botany	061MG	17112144
Botany	062MG	17112144

Important Notes:

COURSE DESCRIPTION: This laboratory course* is designed to teach the student about the structure and functions of simple and complex plants, origin, reproduction, and uses of plants and how plants interact with the environment. Areas of study are scientific thinking and practice, life science content, earth and space content, and science and society. Laboratory activities include experiments with plant growth and development and identifying stages of the life cycles of plants, and may include field study, collecting, and identifying plants. Literacy skills (e.g., reading, writing, speaking) 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 refer to and align with the State of New Mexico Science Standards (NM), the Albuquerque Public Schools Mathematics Standards (APS – MA), 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 the 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:

- Current state adopted textbooks
- *Biology – Exploring Life* – Campbell, Williamson, Heyden – Prentice Hall – 2004
- Class set of soil moisture probes
- Plant-specific growth chamber or incubator
- Growth lights
- Microscopes
- Wisconsin Fast Plants – Carolina Biological

SUGGESTED TITLES/AUTHORS WEB SITES:

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 communicate 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
	1. Describes the essential components of an investigation, including appropriate methodologies, proper equipment, and safety precautions (NM – I.I.I.1). 2. Designs and conducts scientific investigations that include (NM – I.I.I.2): • 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. 3. Uses appropriate technologies to collect, analyze, and communicate scientific data (e.g., computers, calculators, balances, microscopes) (NM – I.I.I.3).	**NOTE: Illustrations include suggested activities for attaining each performance standard. A check (√) refers to a key feature to look for while assessing student performance.** 1 – 4, 6 – 16. The student is at varying developmental stages. To accommodate the student, he/she properly designs and/or performs a controlled experiment using a recognized scientific method, and reports results in either an oral or written format. The proper design includes development of a hypothesis, experimental process, gathering and analysis of data, and logical (e.g., defendable) conclusions. ✓ proper safety techniques ✓ correct use of equipment ✓ appropriate equipment ✓ all required components ✓ evidence of current scientific knowledge ✓ effective communication skills ✓ use of technology ✓ quantitative data (e.g., charts and data) ✓ critical thinking and insights (e.g., proper mathematical analysis)

GRADE 9 - 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
		OR
	4. Conveys results of investigations using scientific concepts, methodologies, and expressions, including (NM – I.I.I.4): • 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.	The student comes up with an everyday problem (e.g., ran out of gas, lost my wallet, locked out of the house) and outlines how he/she solves the problem. The student states a hypothesis, gathers data, and describes the conclusion. In short, he/she goes through the scientific method. Once the student has the idea of how to solve an everyday problem, he/she expands to a scientific problem and becomes more precise. ✓ problem solving ✓ application of the scientific process ✓ inclusion of all required steps ✓ effective communication skills ✓ use of technology
	5. Understands how scientific theories are used to explain and predict natural phenomena (e.g., plate tectonics, ocean currents, structure of atom) (NM – I.I.I.5).	5. The student researches and gathers data on the distance between North America and Europe over the past 100 million years, analyzes the information, records the difference between these two points (then and now), and supports the theory of plate tectonics through sea floor spreading. The student graphs and charts the data and uses the information to predict future and past movement. The student makes a presentation, either orally or in written form, and justifies his/her prediction. (Hint: This illustration explains the diversity of life.) ✓ organization of data ✓ data supports theory ✓ critical thinking/insights ✓ defense of argument ✓ clear communication ✓ graphic organizers
	6. Understands how scientific processes produce valid, reliable results, including (NM – I.I.II.1): • 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.	
	7. Uses scientific reasoning and valid logic to recognize (NM – I.I.II.2): • faulty logic, • cause and effect, • the difference between observation and unsubstantiated inferences and conclusions, and • potential bias.	
	8. Understands how new data and observations can result in new scientific knowledge (NM – I.I.II.3).	
	9. Critically analyzes an accepted explanation by reviewing current scientific knowledge (NM - I.I.II.4).	

GRADE 9 - 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	10. Examines investigations of current interest in science (e.g., superconductivity, molecular machines, age of the universe) (NM – I.I.II.5). 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). 12. Creates multiple displays of data to analyze and explain the relationships in scientific investigations (NM – I.I.III.1). 13. Uses mathematical models to describe, explain, and predict natural phenomena (NM – I.I.III.2). 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). 15. Identifies and applies measurement techniques and consider possible effects of measurement errors (NM – I.I.III.4). 16. Uses mathematics to express and establish scientific relationships (e.g., scientific notation, vectors, dimensional analysis) (NM – I.I.III.5).	OR The student participates in a discussion on evolution. A possible start is to have the student answer some essential questions "What is a theory? and how does someone come up with a theory?" With facilitation the student goes into the Big Bang theory (e.g., no life) to how life began. At this point the student answers the question, "What evidence do we have?" He/She explains life in a general way (e.g., bacterial-like, protists, plant) and comes to understand that plants came before animals and goes through the sequence of plate tectonics, fossil evidence (e.g., primary evidence about the beginning of life), and evolution (e.g., changing from one form to another). Through discussion the student answers some whys (e.g., Why is the plant from this continent different from the plant from another continent?). ✓ active participation in discussions ✓ reasonable responses to essential questions ✓ comprehension of scientific theories

STRAND II: THE CONTENT OF SCIENCE-LIFE
CONTENT STANDARD: The student understands the properties, structures, and processes of living things and the interdependence of living things and their environments.

BENCHMARKS: A. The student understands how the survival of species depends on biodiversity and on complex interactions, including the cycling of matter and the flow of energy.
B. The student understands the genetic basis for inheritance and the basic concepts of biological evolution.
C. The student understands the characteristics, structures, and functions of cells.

GRADE 9 - 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	1. Knows that an ecosystem is complex and may exhibit fluctuations around a steady state or may evolve over time (NM – II.II.I.1). 2. Describes how organisms cooperate and compete in ecosystems (e.g., producers, decomposers, herbivores, carnivores, omnivores, predator-prey, symbiosis, mutualism) (NM – II.II.I.2). 3. Understands and describes how available resources limit the amount of life an ecosystem can support (e.g., energy, water, oxygen, nutrients) (NM – II.II.I.3).	1, 3, 5. In either large or small groups, the student participates in a discussion on what comprises a population, a community, an ecosystem, and a species. The student comes up with a definition to get a foundation and starts talking about energy flowing from one part to the other. The student then selects a local ecosystem (e.g., Rio Grande, foothills, pond) and designs an energy pyramid that features the major organisms that inhabit that ecosystem. The student shows the transfer of energy from the sun through decomposers, including energy loss at each level. ✓ design of pyramid ✓ organisms appropriate for ecosystem ✓ organisms included on proper levels ✓ energy transferences properly noted at each level Extension: The student listens to guest speakers who are local experts on ecosystems.
	4. Critically analyzes how humans modify and change ecosystems (e.g., harvesting, pollution, population growth, technology) (NM – II.II.I.4). 5. Explains how matter and energy flow through biological systems (e.g., organisms, communities, ecosystems), how the total amount of matter and energy is conserved, but some energy is always released as heat to the environment (NM – II.II.I.5).	2, 4, 8, 9. The student discusses unusual plants that have adapted to an area, their characteristics, and why they thrived (e.g., Why did this plant survive in the desert?). The student participates in the design of an ecosystem involving a specific species of plant found in the area (e.g., Rio Grande Bosque) and talks about how the natural ecosystem has changed. The student relates the results of introducing nonnative plants into an ecosystem and how these plants can significantly alter the makeup/structure of the ecosystem (e.g., salt cedar introduced into the Bosque). Based on the design of the ecosystem, the student explains how various plants interact with one another and how they compete for space and resources. He/She determines whys (e.g., Why are some plants more competitive than others? Why is salt cedar such a problem along the Rio Grande Bosque?). ✓ active participation in discussions ✓ ecosystem design

GRADE 9 - 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
		✓ reasonable explanations to questions ✓ analysis/insights
	6. Describes how energy flows from the sun through plants to herbivores to carnivores and decomposers (NM – II.II.I.6). 7. Understands and explains the principles of photosynthesis (i.e., chloroplasts in plants convert light energy, carbon dioxide, and water into chemical energy) (NM – II.II.I.7).	6, 7. Through lectures and textbook readings the student learns that the main energy comes from the sun and the principles of photosynthesis. By this time the student is familiar with cell structure necessary to understand photosynthesis. Using the formula $CO_2 + H_2O \Rightarrow = C_6 H_{12} O_6 + O_2$, the student explains what photosynthesis is, each part of the formula, and how a plant cell uses photosynthesis to make food for the plant. In addition, he/she: • memorizes the formula and either writes it out or recites it back from memory, • talks about forms of oxygen and carbon and the origins of the compounds necessary for photosynthesis to occur, • puts plant leaves under the microscope to see specific chloroplasts and identifies cells and proper organelles, • heats leaves gently to see the chloroplasts flowing within the cell and discusses the fact that they are responding to energy to maximize production (e.g., photosynthetic capabilities), • introduces components of light and explains how the plant captures sunlight to power the process of photosynthesis, • designs an experiment to limit sunlight, and • looks at the results. ✓ understanding of photosynthesis ✓ completion of all required tasks ✓ clarity of explanations Extensions: The student uses drawings to demonstrate understanding (e.g., draws chloroplasts).
	8. Understands and explains the hierarchical classification scheme (i.e., domain, kingdom, phylum, class, order, family, genus, species), including (NM – II.II.I.8): • classification of an organism into a category, • similarity inferred from molecular structure (DNA) closely matching classification based on anatomical similarities, and • similarities of organisms reflecting evolutionary relationships. 9. Understands variation within and among species, including (NM – II.II.I.9): • mutations and genetic drift, and • factors affecting the survival of an organism natural selection.	
	10. Knows how DNA carries all genetic information in the units of heredity called genes, including (NM – II.II.II.1): • the structure of DNA (e.g., subunits A, G, C, T), • information-preserving replication of DNA, and • alteration of genes by inserting, deleting, or substituting parts of DNA. 11. Uses appropriate vocabulary to describe inheritable traits (i.e., genotype, phenotype) (NM – II.II.II.2). 12. Explains the concepts of segregation, independent assortment, and dominant/recessive alleles (NM – II.II.II.3).	10 – 16. Based on the student's prior knowledge and a brief review of the fact that individual species of plants contain a certain number of chromosomes compared with those of humans, he/she re-enacts (e.g., drawing or using actual plants) Mendel's pea plant experiment to illustrate heredity, segregation, independent assortment, and dominant/recessive traits. From here, he/she goes into DNA, its structure and examination of its parts, replication of DNA, alteration of genes, and mutations. ✓ understanding of genetic principles ✓ transference and communication of knowledge

GRADE 9 - 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	13. Identifies traits that can and cannot be inherited (NM – II.II.II.4). 14. Knows how genetic variability results from the recombination and mutation of genes, including (NM – II.II.II.5): • sorting and recombination of genes in sexual reproduction result in a change in DNA that is passed on to offspring, and • radiation or chemical substances can cause mutations in cells, resulting in a permanent change in DNA. 15. Understands the principles of sexual and asexual reproduction, including meiosis and mitosis (NM – II.II.II.6). 16. Knows 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 (NM – II.II.II.7). 17. Describes 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 (NM – II.II.II.8). 18. Critically analyzes the data and observations supporting the conclusion that the species living on Earth today are related by descent from the ancestral one-celled organisms (NM - II.II.II.9). 19. Understands the data, observations, and logic supporting the conclusion that species today evolved from earlier, distinctly different species, originating from the ancestral one-celled organisms (NM – II.II.II.10). 20. Understands that evolution is a consequence of many factors, including the ability of organisms to reproduce, genetic variability, the effect of limited resources, and natural selection (NM – II.II.II.11). 21. Explains how natural selection favors individuals who are better able to survive, reproduce, and leave offspring (NM – II.II.II.12). 22. Analyzes 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 (NM – II.II.II.13).	17 – 22. The student participates in a discussion on, "How did life begin?" He/She gives examples for the ideas brought forth and compares them with the other students' ideas. The discussion springboards into plants and why, for example, a cactus can't be put with an African violet. The concepts of adaptations, natural selection, and structural components are discussed. Using this background information, the student sets up a demonstration in class creating the environments studied. He/She records the data and presents the growth results. A question to be answered is, "Which is better?" ✓ active participation in discussions ✓ use of the scientific process ✓ effective demonstration ✓ response to the essential question

GRADE 9 - 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	23. Knows that cells are made of proteins composed of combinations of amino acids (NM – II.II.III.1). 24. Knows that specialized structures inside cells in most organisms carry out different functions, including (NM – II.II.III.2): • parts of 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, and • prokaryotic and eukaryotic cells. 25. Describes the mechanisms for cellular processes (e.g., energy production and storage, transport of molecules, waste disposal, synthesis of new molecules) (NM – II.II.III.3). 26. Knows 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) (NM – II.II.III.4). 27. Explains how cells differentiate and specialize during the growth of an organism, including (NM – II.II.III.5): • differentiation, regulated through the selected expression of different genes, and • specialized cells, response to stimuli (e.g., nerve cells, sense organs). 28. Knows that DNA directs protein building (e.g., role of RNA) (NM – II.II.III.6). 29. Describes how most cell functions involve chemical reactions, including (NM – II.II.III.7): • promotion or inhibition of biochemical reactions by enzymes, • processes of respiration (e.g., energy production, ATP), and • communication from cell to cell by secretion of a variety of chemicals (e.g., hormones).	23 – 29. The student researches the plant cell and identifies all primary organelles. When the research is completed, each student selects a specific organelle to research further, develops a model of his/her organelle, and presents findings orally to the class. ✓ accurate model ✓ organization ✓ research strategies ✓ key concepts ✓ effective presentation Note: To accommodate diverse learners, leeway is given on the presentation format. The presentation can be oral or written or can be used for extra credit. Optional formats can be portfolios, drawings, or metaphors for cell parts.

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.

BENCHMARK: 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
	1. Describes the characteristics and the evolution of Earth in terms of the geosphere, the hydrosphere, the atmosphere, and the biosphere (NM – II.III.II.1). 2. Understands the changes in Earth's past and the investigative methods used to determine geologic time, including (NM – II.III.II.4): • rock sequences, relative dating, fossil correlation, and radiometric dating , and • geologic time scales, historic changes in life forms, and the evidence for absolute ages (e.g., radiometric methods, tree rings, paleomagnetism). 3. 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). 4. Describes the patterns and relationships in the circulation of air and water driven by the sun's radiant energy, including (NM – II.III.II.8): • patterns in weather systems related to the transfer of energy, • differences between climate and weather, • global climate, global warming, and the greenhouse effect, and • El Niño, La Niña, and other climatic trends. 5. Knows 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) (NM – II.III.II.9). 6. Explains how layers of the atmosphere (e.g., ozone, ionosphere) change naturally and artificially (NM – II.III.II.11).	1 – 7. Early in the year the student talks about, through discussion, the creation of plants (e.g., Big Bang Theory), the scientific method, the time frames involved, and what was created first. Using handouts, the student colors the layers of the Earth, talks about the evolution of Earth, and how certain cultures view the Earth as a living thing. This gives the student a grasp of evolution and ecology. Further discussion revolves around the following topics where the student: • answers the questions: How do you know, and what is your evidence? (e.g., fossil records, radiometric dating), • studies the geologic process (e.g., rock formation, volcanism, erosion) and answers specific questions (e.g., Why do we find seashells on top of the Sandia Mountains?), • describes various ecosystems (e.g., desert, semidesert) and explains why it was created and why we no longer see certain types of plants (e.g., fernlike plants), • examines weather patterns, specifically Albuquerque's weather patterns, to identify the type of biome it is, what changed it, what caused it to change, and how it evolved into a desert environment, and • looks at how humans are affecting the environment (e.g., aquifers, changes in man-made plant systems, xeriscaping, synthetic grass, low water flush drip system). The student take notes and creates for presentation a graphic organizer on one of the above topics that interested him/her. The student posts his/her graphic organizer on the wall and does a gallery walk to view all of the different visual representations. ✓ listening skills ✓ active participation in discussions ✓ note taking ✓ synthesis

GRADE 9 - 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	7. Explains 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) (NM – II.III.II.12).	✓ effective visual display **Note:** Videos can be used to compare and contrast ideas and topics.

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
	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.I.1). 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.I.2). 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.I.3). 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.I.4). 5. Understands that applications of genetics can meet human needs and can create new problems (e.g., agriculture, medicine, cloning) (NM – III.I.I.5). 6. Analyzes the impact of digital technologies on the availability, creation, and dissemination of information (NM – III.I.I.6). 7. Describes how human activities have affected ozone in the upper atmosphere and how it affects health and the environment (NM – III.I.I.7). 8. Describes uses of radioactivity (e.g., nuclear power, nuclear medicine, radiometric dating) (NM – III.I.I.8).	1 – 14. Through lectures, textbook readings, and discussions, the student makes connections between plants and medicine, looks at pharmaceuticals, and talks about extracts from plants or modifications of compounds. He/She examines cultural aspects (e.g., Native American) to relate how medicines have proven to be useful components and how some cultures revolve around plant ceremonies. The student looks at recent inventions and innovations in the field that have been improved to increase yield or efficiency (e.g., drip system for low water areas, corn used as gasoline, development of hybrids in plants, plants that are pest resistant, cloning of fruit trees through grafting). The student then selects from a pre-established list a topic (e.g., alternatives to gasoline, rice, rubber) to research. The research includes the history of the product, its diversity, and its economical importance. ✓ active participation in discussions ✓ technological influences ✓ societal factors ✓ thorough research ✓ effective communication of ideas The student participates in a separate discussion on alternative forms of energy (e.g., oil comes from plants) and what is considered renewable and nonrenewable. He/She then gives additional examples of renewable and nonrenewable resources.

GRADE 9 - 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	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.I.9). 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.I.10). 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). 12. Explains how societies can change ecosystems and how these changes can be reversible or irreversible (NM – III.I.I.12). 13. Describes how environmental, economic, and political interests impact resource management and use in New Mexico (NM – III.I.I.13). 14. Identifies how science has produced knowledge that is relevant to individual health and material prosperity (NM – III.I.I.15). 15. 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). 16. 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).	15, 16. Using the scientific method process, the student examines religious aspects and some things science cannot answer by responding to certain scenarios. As an example the student considers cloning. Is it good? Why or why not? Is it right or wrong? Where does it fit into our expectations and advancements of science? How does ethics fit into this? The student's answers must be based on a scientific premise and not on his/her perceptions gained from TV, the movies, or what was read in a science fiction novel. ✓ scientific response to questions ✓ thoughtfulness ✓ analysis

GRADE 9 - 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	17. 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). 18. 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.I.19).	17, 18. 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. 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 horticulturist?). The student talks about his personal career interest and explains where science is used in this career (e.g., mechanics, vet, park ranger). OR 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., landscape people, electrician, forensics lab person) in the science field talk about aspects of their jobs. After the fair the student either orally or in written format summarizes one career field that held special interest to him/her highlighting the science connection. Options: The student helps in the organization of the event by suggesting and contacting some of the guest speakers. Some of these speakers could be personal connections that he/she has (e.g., parents, former students). ✓ individual participation ✓ listening skills ✓ personal connections ✓ scientific significance to career fields ✓ effective presentation

STRAND V: LITERACY
CONTENT STANDARD: The student communicates biological 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
	1. Develops and demonstrates proficiency with the following strategies to approach reading for information across content areas (APS – LA I.1): • 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. 2. Identifies and uses roots, prefixes, and suffixes to determine meaning of words (APS – LA I.4). 3. Uses textual evidence to develop and support an interpretation of a scientific process or concept (APS – LA II.2).	1 – 11. Early in the first semester, the student finds a recent article that deals with a biological topic (e.g., environmental, ecological, medical) and writes a summary of the article at least 250 words in length. In the second semester, the student finds an article that deals with an ecological component (e.g., predator/prey) and writes a synopsis to cover who, what why, when, where, how, and a personal reflection. ✓ comprehension of material that was read ✓ analysis ✓ organization ✓ effective communication ✓ writing elements and conventions ✓ personal connections Options: The student presents the information orally or visually.

GRADE 9 - 12	PERFORMANCE STANDARDS	ILLUSTRATIONS
	4. Develops increased competence in using the writing process to create a final product (APS – LA III.1). 5. Develops increased competence in using elements of effective writing (APS – LA III.2). 6. Supports an informed opinion (APS – LA III.6): • 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. 7. Responds to a variety of written, electronic, and other media (APS – LA III.7). 8. Develops increased competence with speaking and language conventions (APS – LA IV.3). 9. Demonstrates appropriate discussion in group discussions (APS – LA V.2). 10. Evaluates information to develop informed opinions (APS – LA VI.1). 11. Develops increased competence in using research strategies (APS – LA VI.5).	4. To accommodate the student with special needs (e.g., LEP, special education), the student can take notes during lectures and discussions and summarize them. OR Using a preselected article that deals with a biological topic, the student participates in a text-rendering, protocol format. During class time or as an outside reading assignment, the student reads the article and, as he/she reads, underlines one sentence that stands out for him/her, underlines a phrase, circles a word, and thinks of a word that is **NOT** in the text. The student joins a small group (e.g., 5 or 6 members) and going around four times, beginning with the first (e.g., underlines one sentence) says what was selected. It is OK for the student to repeat what someone else has already said. When stating his/her word that was NOT in the article, the student explains why that word was chosen. This protocol highlights for the student the main ideas and concepts of the article and allows him/her to know what other students are thinking. ✓ active participation in protocol activity ✓ understanding of critical points ✓ analysis Although the above examples represent specific instances where the literacy standards are met, multiple opportunities are presented throughout the year and throughout the curriculum where the student demonstrates reading, speaking, writing, and research strategies. They are reflected in every strand.