NEW MEXICO ASSESSMENT OF SCIENCE READINESS

NM-ASR Proficiency Level Descriptors

Grade 11

Policy PLDs

Policy PLDs define the knowledge and skill level expectations for all grades and content areas for the NM-MSSA and NM-ASR.

Level 4. Advanced

Students demonstrate evidence of **thorough** understanding and use of college and career readiness knowledge, skills, and abilities.

Level 3. Proficient

Students demonstrate evidence of **satisfactory** understanding and use of college and career readiness knowledge, skills, and abilities.

Level 2. Nearing Proficiency

Students demonstrate evidence of **partial** understanding and use of college and career readiness knowledge, skills, and abilities.

Level 1. Novice

Students demonstrate evidence of **emerging** understanding and use of college and career readiness knowledge, skills, and abilities.

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Borderline PLDs

Range PLDs describe the knowledge and skills that students just barely within each proficiency level are expected to be able to demonstrate. In line with the nature of the science standards, the statements combine science and engineering practices, disciplinary core ideas, and crosscutting concepts that students are expected to integrate and demonstrate.

Advanced

Students at the borderline of the **Advanced** level in most situations[1] can demonstrate evidence of thorough understanding and use of all three dimensions (science and engineering practices, crosscutting concepts, and disciplinary core ideas) to make sense of phenomena and/or to design solutions to problems in the physical, life, and Earth and space sciences. They also sometimes demonstrate the skills and understandings at the Proficient level rather than the skills and understandings of the Advanced level. Students performing at the borderline of the Advanced level can be expected in most situations[1] to be able to demonstrate knowledge and skills such as in the following examples, as evidence of just barely thorough understanding and use of the NM STEM Ready! Science Standards:

- Use an understanding of the periodic table to predict multiple relative properties of elements, plan and conduct an investigation of phenomena related to multiple bulk scale properties of substances and explain how these relate to the strength of electrical forces between particles, explain phenomena about the release or absorption of energy by a chemical system by developing models to show changes in total bond energy, use multiple pieces of evidence to explain phenomena using an understanding of how changes in temperature and concentration affect reaction rate, explain phenomena about chemical systems at equilibrium using an understanding of how multiple conditions on the system could be changed to produce more or fewer products or more or fewer reactants, use multiple mathematical representations to support claims that mass is conserved during a chemical reaction, and develop multiple models to describe phenomena using an understanding of the changes in the nucleus of an atom and the energy released during fission, fusion, and radioactive decay. (PS1)
- Analyze and use multiple pieces of data from phenomena to show that f = ma; use multiple mathematical representations of phenomena and an understanding of momentum to support the claim that the total momentum of a system is conserved when there is no net force on the system; apply multiple scientific and engineering ideas to design, evaluate, and refine multiple devices that minimize force on an object during a collision; use mathematical representations of Newton's law of gravitation and Coulomb's law to describe and make predictions about familiar and unfamiliar phenomena using an understanding of gravitational and electrostatic forces between objects; plan and conduct an investigation of phenomena to produce multiple pieces of evidence that prove an electric current produces a magnetic field and that a changing magnetic field produces electric current; and communicate multiple pieces of information about

phenomena using an understanding of how the molecular structure of a material relates to its macroscopic properties and makes the material well suited for particular uses. (PS2)

- Create multiple computational models of phenomena to calculate changes in energy of a system when energy flows into and out of the system is known; develop and use multiple models to explain phenomena using an understanding of how energy at the macroscopic scale can be accounted for at the microscopic scale in energy associated with particle motion and relative position; design, build, and refine devices that convert one form of energy into another; plan and conduct an investigation of phenomena to provide multiple pieces of evidence using an understanding that when two components of different temperatures are combined within a closed system, both components eventually have the same temperature; and develop and use a model to explain phenomena related to the forces and the changes in energy between two objects interacting through electric fields and magnetic fields. (PS3)
- Explain phenomena using an understanding of multiple mathematical representations regarding relationships among frequency, wavelength, and speed of waves in various media; evaluate multiple questions about phenomena using an understanding of the advantages of using digital transmission and storage of information; use multiple phenomena to evaluate claims that electromagnetic radiation can be described using a wave or particle model; in the context of phenomena, evaluate multiple claims about the effects that different frequencies of electromagnetic radiation have on matter; and communicate technical information about phenomena using an understanding of how multiple specific technological devices use the principles of wave behavior and wave interactions to transmit and capture information and energy. (PS4)
- Use multiple pieces of evidence to explain phenomena using an understanding of how the structure of DNA determines the structure of proteins and how proteins carry out the functions of life through specialized cells; develop and use a complex model to describe phenomena using an understanding of the organization of interacting systems within multicellular organisms; plan and conduct an investigation to provide multiple pieces of evidence about phenomena that show that feedback mechanisms maintain homeostasis; use a complex model to describe phenomena using an understanding of how cell division and differentiation help produce and maintain complex organisms; use a complex model to describe phenomena using an understanding of how photosynthesis transforms light energy into stored chemical energy; use multiple pieces of evidence to construct and revise an explanation about phenomena using an understanding of how carbon, hydrogen, and oxygen from sugar molecules combine with other elements to form amino acids and other large carbon-based molecules; and use a complex model to describe phenomena using an understanding that cellular respiration is a chemical process that breaks the bonds in food and oxygen molecules and forms bonds in new compounds, which results in a net transfer of energy. (LS1)
- Use mathematical and computational representations to support explanations of phenomena using an understanding of factors that affect carrying capacity of ecosystems at different scales; use multiple pieces of evidence and mathematical representations to support and revise explanations of phenomena using an understanding of factors affecting biodiversity and populations in ecosystems of different scales and to support claims for the cycling of matter and flow of energy among organisms in an ecosystem; use evidence to construct and revise an

explanation of phenomena using an understanding of the cycling of matter and flow of energy in aerobic and anaerobic conditions; develop models to describe phenomena using an understanding of the role of photosynthesis and cellular respiration in the cycling of carbon among Earth's spheres; evaluate multiple claims, pieces of evidence, and reasoning about phenomena involving complex interactions in ecosystems using an understanding that these interactions maintain relatively consistent numbers and types of organisms under stable conditions, but changing conditions may result in a new ecosystem; design, evaluate, and refine solutions for reducing impacts of human activities on the environment or biodiversity; and evaluate multiple pieces of evidence about phenomena using an understanding of the role of group behavior on individual and species' chances to survive and reproduce. (LS2)

- Ask multiple questions about phenomena to clarify relationships surrounding the role of DNA in chromosomes in coding the instructions for traits passed from parents to offspring; use multiple pieces of evidence to make and defend a claim about phenomena using an understanding that inheritable genetic variations may result from new genetic combinations through meiosis, viable errors during replication, and/or mutations caused by environmental factors; and apply multiple concepts of statistics and probability to explain phenomena using an understanding of the variation and distribution of expressed traits in a population. (LS3)
- Communicate multiple pieces of scientific information about phenomena using an understanding that common ancestry and biological evolution are supported by multiple lines of empirical evidence; use multiple pieces of evidence to construct an explanation about phenomena using an understanding that the process of evolution primarily results from four factors: the potential for a species to increase in number, the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, competition for limited resources, and the proliferation of those organisms that are better able to survive and reproduce in the environment; apply multiple concepts of statistics and probability to support explanations of phenomena using an understanding that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking the trait; use multiple pieces of evidence to construct an explanation of phenomena using an understanding of how natural selection leads to adaptation of populations; evaluate multiple pieces of evidence supporting claims about phenomena using an understanding that changes in environmental conditions may result in: increases in numbers of individuals of some species, the emergence of new species over time, and the extinction of other species; and create and revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. (LS4)
- Use multiple pieces of evidence to develop a model to describe phenomena using an understanding of the life span of the Sun and the role of nuclear fusion in the Sun's core to release energy that reaches Earth in the form of radiation; use multiple pieces of evidence and an understanding of the phenomena of light spectra, motion of distant galaxies, and composition of matter in the universe to construct an explanation of the big bang theory;

communicate multiple scientific ideas about phenomena using an understanding of the way stars produce different elements over their life cycles; use mathematical and computational representations of phenomena to predict the motion of orbiting objects in the solar system; evaluate multiple pieces of evidence of phenomena using an understanding of past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks; and apply scientific reasoning and an understanding of multiple pieces of evidence from ancient Earth materials, meteorites, and other planetary surfaces to describe phenomena about Earth's formation and early history. (ESS1)

- Develop models to describe phenomena using an understanding of how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean floor features; analyze multiple types of geoscience data about phenomena to make a claim that one change to Earth's surface can create feedback that causes changes to other Earth systems; use multiple pieces of evidence to develop a model of Earth's interior to describe phenomena using an understanding of the cycling of matter by thermal convection; use models to describe phenomena using an understanding of how variations in the flow of energy into and out of Earth's systems result in changes in climate; plan and conduct investigations of phenomena related to the properties of water using an understanding of water's effects on Earth materials and surface processes; develop quantitative models to describe phenomena using an understanding of the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere; and use multiple pieces of evidence to construct an argument about phenomena using an understanding of the simultaneous coevolution of Earth's systems and life on Earth. (ESS2)
- Use multiple pieces of evidence to construct an explanation about phenomena using an understanding of how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity; using an understanding of cost-benefit ratios, evaluate multiple competing design solutions for developing, managing, and utilizing energy and mineral resources; create computational simulations of phenomena to show the relationships among management of natural resources, the sustainability of human populations, and biodiversity; using an understanding of human impacts on natural systems, evaluate and refine a technological solution that reduces these impacts; analyze multiple pieces of geoscience data and multiple global climate models of phenomena to make a forecast of the current rate of climate change and associated future impacts to Earth systems; and use computational representations to describe phenomena using an understanding of the relationships among Earth systems and how those relationships are modified due to human activity. (ESS3)
- Analyze a major global challenge to specify multiple qualitative and quantitative criteria and constraints for solutions that account for multiple societal needs and wants; design an engineering solution to multiple complex real-world problems by breaking them down into smaller, more manageable problems; evaluate and refine a solution to a complex real-world

problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as social, cultural, and environmental impacts; and use a computer simulation to model the impact of multiple proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. (ETS1)

- Construct an argument using multiple claims, multiple pieces of scientific evidence, and reasoning that helps decision makers with a New Mexico challenge or opportunity as it relates to science. (SS2NM)

Proficient

Students at the borderline of the **Proficient** level in most situations[1] can demonstrate evidence of satisfactory understanding and use of all three dimensions (science and engineering practices, crosscutting concepts, and disciplinary core ideas) to make sense of phenomena and/or to design solutions to problems in the physical, life, and Earth and space sciences. They also sometimes demonstrate the skills and understandings at the Nearing Proficiency level rather than the skills and understandings of the Proficient level. Students performing at the borderline of the Proficient level can be expected in most situations[1] to be able to demonstrate knowledge and skills such as in the following examples, as evidence of just barely satisfactory understanding and use of the NM STEM Ready! Science Standards:

- Use an understanding of the periodic table to predict one or two relative properties of elements, plan and conduct an investigation of phenomena related to one or two bulk scale properties of substances and explain how these relate to the strength of electrical forces between particles, explain phenomena about the release or absorption of energy by a chemical system by developing a model to show changes in total bond energy, use one or two pieces of evidence to explain phenomena using an understanding of how changes in temperature or concentration affect reaction rate, explain phenomena about chemical systems at equilibrium using an understanding of how one or two of the conditions on the system could be changed to produce more products, use one or two mathematical representations to support claims that mass is conserved during a chemical reaction, and develop one or two models to describe phenomena using an understanding of the changes in the nucleus of an atom and the energy released during fission, fusion, and radioactive decay. (PS1)
- Analyze and use one or two pieces of data from phenomena to show that f = ma; use one or two mathematical representations of phenomena and an understanding of momentum to support the claim that the total momentum of a system is conserved when there is no net force on the system; apply one or two scientific and engineering ideas to design, evaluate, and refine a device that minimizes force on an object during a collision; use mathematical representations of Newton's law of gravitation and Coulomb's law to describe and make predictions about familiar

phenomena using an understanding of gravitational and electrostatic forces between objects; plan and conduct an investigation of phenomena to produce one or two pieces of evidence that prove an electric current produces a magnetic field and that a changing magnetic field produces electric current; and communicate one or two pieces of information about phenomena using an understanding of how the molecular structure of a material relates to its macroscopic properties and makes the material well suited for particular uses. (PS2)

- Create a computational model of phenomena to calculate changes in energy of a system when energy flows into and out of the system is known; develop and use one or two models to explain phenomena using an understanding of how energy at the macroscopic scale can be accounted for at the microscopic scale in energy associated with particle motion and relative position; design, build, and refine a device that converts one form of energy into another; plan and conduct an investigation of phenomena to provide one or two pieces of evidence using an understanding that when two components of different temperatures are combined within a closed system, both components eventually have the same temperature; and develop and use a model to explain phenomena related to the forces and the changes in energy between two objects interacting through electric or magnetic fields. (PS3)
- Explain phenomena using an understanding of one or two mathematical representations regarding relationships among frequency, wavelength, and speed of waves in various media; evaluate one or two questions about phenomena using an understanding of the advantages of using digital transmission and storage of information; use one or two phenomena to evaluate claims that electromagnetic radiation can be described using a wave or particle model; in the context of phenomena, evaluate one or two claims about the effects that different frequencies of electromagnetic radiation have on matter; and communicate technical information about phenomena using an understanding of how one or two specific technological devices use the principles of wave behavior and wave interactions to transmit and capture information and energy. (PS4)
- Use evidence to explain phenomena using an understanding of how the structure of DNA determines the structure of proteins and how proteins carry out the functions of life through specialized cells; develop and use a model to describe phenomena using an understanding of the organization of interacting systems within multicellular organisms; plan and conduct an investigation to provide evidence about phenomena that show that feedback mechanisms maintain homeostasis; use a model to describe phenomena using an understanding of how cell division and differentiation help produce and maintain complex organisms; use a model to describe phenomena using an understanding of how photosynthesis transforms light energy into stored chemical energy; use evidence to construct and revise an explanation about phenomena using an understanding of how carbon, hydrogen, and oxygen from sugar molecules combine with other elements to form amino acids and/or other large carbon-based molecules; and use a model to describe phenomena using an understanding that cellular respiration is a

chemical process that breaks the bonds in food and oxygen molecules and forms bonds in new compounds, which results in a net transfer of energy. (LS1)

- Use mathematical or computational representations to support explanations of phenomena using an understanding of factors that affect carrying capacity of ecosystems at different scales; use one or two pieces of evidence and one or two mathematical representations to support and revise explanations of phenomena using an understanding of factors affecting biodiversity and populations in ecosystems of different scales and to support claims for the cycling of matter and flow of energy among organisms in an ecosystem; use evidence to construct or revise an explanation of phenomena using an understanding of the cycling of matter and flow of energy in aerobic and anaerobic conditions; develop a model to describe phenomena using an understanding of the role of photosynthesis and cellular respiration in the cycling of carbon among Earth's spheres; evaluate one or two claims, pieces of evidence, and reasoning about phenomena involving complex interactions in ecosystems using an understanding that these interactions maintain relatively consistent numbers and types of organisms under stable conditions, but changing conditions may result in a new ecosystem; design, evaluate, and refine a solution for reducing impacts of human activities on the environment or biodiversity; and evaluate one or two pieces of evidence about phenomena using an understanding of the role of group behavior on individual and species' chances to survive and reproduce. (LS2)
- Ask one or two questions about phenomena to clarify relationships about the role of DNA in chromosomes in coding the instructions for traits passed from parents to offspring; use one or two pieces of evidence to make and defend a claim about phenomena using an understanding that inheritable genetic variations may result from new genetic combinations through meiosis, viable errors during replication, and/or mutations caused by environmental factors; and apply one or two concepts of statistics and probability to explain phenomena using an understanding of the variation and distribution of expressed traits in a population. (LS3)
- Communicate one or two pieces of scientific information about phenomena using an understanding that common ancestry and biological evolution are supported by multiple lines of empirical evidence; use one or two pieces of evidence to construct an explanation about phenomena using an understanding that the process of evolution primarily results from four factors: the potential for a species to increase in number, the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, competition for limited resources, and the proliferation of those organisms that are better able to survive and reproduce in the environment; apply one or two concepts of statistics and probability to support explanations of phenomena using an understanding that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking the trait; use one or two pieces of evidence to construct an explanation of phenomena using an understanding of how natural selection leads to adaptation of populations; evaluate one or two pieces of evidence supporting claims about phenomena using an understanding that changes in environmental

conditions may result in: increases in numbers of individuals of some species, the emergence of new species over time, and the extinction of other species; and create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. (LS4)

- Use one or two pieces of evidence to develop a model to describe phenomena using an understanding of the life span of the Sun and the role of nuclear fusion in the Sun's core to release energy that reaches Earth in the form of radiation; use one or two pieces of evidence and an understanding of the phenomena of light spectra, motion of distant galaxies, and composition of matter in the universe to construct an explanation of the big bang theory; communicate one or two scientific ideas about phenomena using an understanding of the way stars produce different elements over their life cycles; use mathematical or computational representations of phenomena to predict the motion of orbiting objects in the solar system; evaluate one or two pieces of evidence of phenomena using an understanding of past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks; and apply scientific reasoning and an understanding of one or two pieces of evidence from ancient Earth materials, meteorites, and other planetary surfaces to describe phenomena about Earth's formation and early history. (ESS1)
- Develop a model to describe phenomena using an understanding of how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean floor features; analyze one type of geoscience data about phenomena to make a claim that one change to Earth's surface can create feedback that causes changes to other Earth systems; use one or two pieces of evidence to develop a model of Earth's interior to describe phenomena using an understanding of the cycling of matter by thermal convection; use a model to describe phenomena using an understanding of how variations in the flow of energy into and out of Earth's systems result in changes in climate; plan and conduct an investigation of phenomena related to the properties of water using an understanding of water's effects on Earth materials and surface processes; develop a quantitative model to describe phenomena using an understanding of the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere; and use one or two pieces of evidence to construct an argument about phenomena using an understanding of the simultaneous coevolution of Earth's systems and life on Earth. (ESS2)
- Use one or two pieces of evidence to construct an explanation about phenomena using an understanding of how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity; using an understanding of cost-benefit ratios, evaluate two competing design solutions for developing, managing, and utilizing energy and mineral resources; create a computational simulation of phenomena to show the relationships among management of natural resources, the sustainability of human populations, and biodiversity; using an understanding of human impacts on natural systems, evaluate or refine a technological solution that reduces these impacts; analyze one or two pieces of

geoscience data and one or two global climate models of phenomena to make a forecast of the current rate of climate change and associated future impacts to Earth systems; and use a computational representation to describe phenomena using an understanding of the relationships among Earth systems and how those relationships are modified due to human activity. (ESS3)

- Analyze a major global challenge to specify one or two qualitative and quantitative criteria and constraints for solutions that account for one or two societal needs and wants; design an engineering solution to a complex real-world problem by breaking it down into smaller, more manageable problems; evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as social, cultural, and environmental impacts; and use a computer simulation to model the impact of two proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. (ETS1)
- Construct an argument using one or two claims, one or two pieces of scientific evidence, and reasoning that helps decision makers with a New Mexico challenge or opportunity as it relates to science. (SS2NM)

Nearing Proficiency

Students at the borderline of the **Nearing Proficiency** level in most situations[1] can demonstrate evidence of partial understanding and use of all three dimensions (science and engineering practices, crosscutting concepts, and disciplinary core ideas) to make sense of phenomena and/or to design solutions to problems in the physical, life, and Earth and space sciences. They also sometimes demonstrate the skills and understandings at the Novice level rather than the skills and understandings of the Nearing Proficient level. Students performing at the borderline of the Nearing Proficiency level can be expected in most situations[1] to be able to demonstrate knowledge and skills such as in the following examples, as evidence of just barely partial understanding and use of the NM STEM Ready! Science Standards:

- Use a partial understanding of the periodic table to predict one relative property of elements, conduct an investigation of phenomena related to bulk scale properties of substances or construct a partial explanation of how these relate to the strength of electrical forces between particles, describe phenomena about the release or absorption of energy by a chemical system, explain phenomena using a partial understanding of how changes in temperature or concentration affect reaction rate, explain phenomena about chemical systems at equilibrium using a partial understanding of how one condition on the system could be changed to produce more products, use a mathematical representation to support a claim that mass is conserved during a chemical reaction, and use models to describe phenomena using a partial

understanding of the changes in the nucleus of an atom or the energy released during fission, fusion, or radioactive decay. (PS1)

- Use data from phenomena to show that f = ma, use a mathematical representation of a phenomenon and a partial understanding of momentum to support the claim that the total momentum of a system is conserved, apply a scientific or an engineering idea to design a device that minimizes force on an object during a collision, use mathematical representations of Newton's law of gravitation or Coulomb's law to describe phenomena using a partial understanding of gravitational and electrostatic forces between objects, conduct an investigation of phenomena to produce evidence that an electric current produces a magnetic field or that a changing magnetic field produces electric current, and communicate information about phenomena using a partial understanding of how the molecular structure of a material relates to its macroscopic properties or makes the material well suited for particular uses. (PS2)
- Use a computational model of phenomena to calculate changes in energy of a system when energy flows into and out of the system is known; use models to explain phenomena using a partial understanding of how energy at the macroscopic scale can be accounted for at the microscopic scale in energy associated with particle motion or relative position; design a device that converts one form of energy into another; conduct an investigation of phenomena that provides evidence using a partial understanding that when two components of different temperatures are combined within a closed system, both components eventually have the same temperature; and use a model to explain phenomena related to the forces or the changes in energy between two objects interacting through electric or magnetic fields. (PS3)
- Explain phenomena using an understanding of a mathematical representation regarding one relationship among frequency, wavelength, and speed of waves in various media; ask questions about phenomena using a partial understanding of the advantages of using digital transmission and storage of information; use one phenomenon to support a claim that electromagnetic radiation may be described using a wave or particle model; make a claim about phenomena related to the effects that different frequencies of electromagnetic radiation have on matter; and communicate information about phenomena using a partial understanding of how specific technological devices use the principles of wave behavior or wave interactions to transmit or capture information and energy. (PS4)
- Use evidence to explain phenomena using a partial understanding of how the structure of DNA determines the structure of proteins; use a model to describe phenomena using a partial understanding of the organization of interacting systems within multicellular organisms; conduct an investigation to provide evidence about phenomena that show that some feedback mechanisms maintain homeostasis; use a model to describe phenomena using a partial understanding of how cell division or differentiation helps produce or maintain a complex organism; use a model to describe phenomena using a partial understanding of how photosynthesis transforms light energy into stored chemical energy; describe that carbon,

hydrogen, and oxygen from sugar molecules combine with other elements to form amino acids or other large carbon-based molecules; and use a model to describe phenomena using a partial understanding that cellular respiration is a chemical process that breaks the bonds in food or oxygen molecules, forms bonds in new compounds, or results in a net transfer of energy. (LS1)

- Use mathematical or computational representations to support explanations of phenomena using a partial understanding of factors that affect carrying capacity of ecosystems; use evidence or mathematical representations to describe factors affecting biodiversity or populations in ecosystems and to support a claim for the cycling of matter or flow of energy among organisms in an ecosystem; use evidence to construct an explanation of phenomena using a partial understanding of the cycling of matter and flow of energy in aerobic or anaerobic conditions; use a model to describe phenomena using an understanding of the role of photosynthesis or cellular respiration in the cycling of carbon; evaluate a claim about a phenomenon involving interactions in ecosystems using a partial understanding that these interactions maintain relatively consistent numbers and types of organisms under stable conditions, but changing conditions may result in a new ecosystem; identify a solution for reducing impacts of human activities on the environment or biodiversity; and use evidence to describe the role of group behavior on individual and species' chances to survive and reproduce. (LS2)
- Ask a question about a phenomenon to clarify relationships about the role of DNA in chromosomes in coding the instructions for traits passed from parents to offspring; make a claim about phenomena using a partial understanding that inheritable genetic variations may result from new genetic combinations through meiosis, viable errors during replication, or mutations caused by environmental factors; and describe phenomena using an understanding of the variation and distribution of expressed traits in a population. (LS3)
- Communicate scientific information about phenomena using a partial understanding that common ancestry and biological evolution are supported by empirical evidence; use evidence to construct an explanation about phenomena using a partial understanding that the process of evolution primarily results from one or two of the following factors: the potential for a species to increase in number, the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, competition for limited resources, and the proliferation of those organisms that are better able to survive and reproduce in the environment; apply concepts of statistics or probability to explain phenomena using a partial understanding that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking the trait; explain phenomena using a partial understanding of how natural selection leads to adaptation of populations; use evidence to support claims about phenomena using a partial understanding that changes in environmental conditions may result in one or two of the following: increases in numbers of individuals of some species, the emergence of new species over time, or the extinction of other species; and use a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. (LS4)

- Use evidence to develop a model to describe phenomena using a partial understanding of the life span of the Sun or the role of nuclear fusion in the Sun's core to release energy that reaches Earth in the form of radiation; use evidence and a partial understanding of the phenomena of light spectra, motion of distant galaxies, or composition of matter in the universe to construct an explanation of the big bang theory; communicate a scientific idea about a phenomenon using a partial understanding of the way stars produce different elements over their life cycles; use a mathematical or computational representation of phenomena to predict the motion of orbiting objects in the solar system; use evidence of phenomena using a partial understanding of past and current movements of continental and oceanic crust or the theory of plate tectonics to explain the ages of crustal rocks; and apply scientific reasoning or a partial understanding of evidence from ancient Earth materials, meteorites, and other planetary surfaces to describe phenomena about Earth's formation and early history. (ESS1)
- Use a model to describe phenomena using a partial understanding of how Earth's internal and surface processes operate to form continental and ocean floor features; use geoscience data about phenomena to make a claim that one change to Earth's surface can create feedback that causes changes to other Earth systems; develop a model of Earth's interior to describe phenomena using an understanding of the cycling of matter by thermal convection; use a model to describe phenomena using a partial understanding of how variations in the flow of energy into and out of Earth's systems result in changes in climate; conduct an investigation of phenomena related to the properties of water using a partial understanding of water's effects on Earth materials or surface processes; use a quantitative model to describe phenomena using a partial understanding of the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere; and use evidence to make a claim about phenomena using a partial understanding of the simultaneous coevolution of Earth's systems and life on Earth. (ESS2)
- Use evidence to construct an explanation about phenomena using a partial understanding of how the availability of natural resources, occurrence of natural hazards, or changes in climate have influenced human activity; using a partial understanding of cost-benefit ratios, evaluate a design solution for developing, managing, or utilizing energy or mineral resources; use a computational simulation of phenomena to show some of the relationships among management of natural resources, the sustainability of human populations, and biodiversity; using a partial understanding of human impacts on natural systems, describe a technological solution that reduces these impacts; use geoscience data or global climate models of phenomena to make a forecast of the current rate of climate change or associated future impacts to Earth systems; and use a computational representation to describe phenomena using a partial understanding of the relationships among Earth systems or how those relationships are modified due to human activity. (ESS3)
- Analyze a major global challenge to specify a qualitative or quantitative criterion or constraint for a solution that accounts for a societal need or want; describe one or two ways a complex

real-world problem could be broken down into smaller, more manageable problems that could be solved through engineering; explain how a solution to a complex real-world problem meets required criteria or explain one or two trade-offs of the solution; and use a computer simulation to model the impact of a proposed solution to a complex real-world problem with two or three criteria and constraints on interactions within or between systems relevant to the problem. (ETS1)

- Use evidence and reasoning to support a claim that helps decision makers with a New Mexico challenge or opportunity as it relates to science. (SS2NM)

Novice

Students at the **Novice** level demonstrate evidence of emerging understanding and use of all three dimensions (science and engineering practices, crosscutting concepts, and disciplinary core ideas) to make sense of phenomena and/or to design solutions to problems in the physical, life, and Earth and space sciences.

[1]Most situations refers to the following. Students at level X can be expected to be able to demonstrate knowledge and skills for most but not all:

- Combinations of disciplinary core ideas, practices, and crosscutting concepts
- Science phenomena, in which students are required to apply their knowledge of science content and mastery of crosscutting concepts and practices