NEW MEXICO ASSESSMENT OF SCIENCE READINESS

NM-ASR Proficiency Level Descriptors

Grade 8

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:

- Develop, use, and analyze models to describe or explain phenomena using an understanding of the structure of matter; to predict, describe, and explain phenomena using an understanding of changes in particle motion and state; and to provide evidence for and describe phenomena using an understanding of conservation of mass during multiple physical and chemical changes. (PS1)
- Plan, carry out, and refine investigations to provide evidence to explain phenomena using an understanding of the effects of forces, interactions, and mass on the motion of objects, as well as analyze various data to evaluate claims about phenomena using an understanding of gravitational interactions in systems, and to design and/or compare multiple solutions to a problem using an understanding of systems of colliding objects. (PS2)
- Plan, carry out, and refine investigations, use and analyze data, and develop, use, and analyze models to explain phenomena using an understanding of various relationships involving kinetic and potential energy in systems, as well as apply such understanding to design, test, and evaluate devices to solve problems related to energy transfer and to support and/or evaluate claims about phenomena related to energy transfer. (PS3)
- Develop, use, and apply mathematical representations, patterns, and models to explain phenomena using an understanding of wave properties and relationships and wave interactions with various materials, and synthesize multiple sources of information using an understanding of signal types to evaluate claims about phenomena related to reliability of digital and analog signals. (PS4)
- Use multiple pieces of evidence from investigations of phenomena to explain that living things are made of cells; develop and use models of phenomena to describe the function of a cell and its parts and to describe how food is rearranged in organisms through chemical reactions to support growth and/or release energy; support arguments about phenomena using multiple

pieces of evidence and an understanding that the body is a system of interacting subsystems composed of cells; support an explanation for how several animal behaviors and several specialized plant structures affect the probability of reproductive success; use multiple pieces of evidence and an understanding of environmental and genetic factors to explain phenomena about how those factors influence the growth of organisms; construct an explanation using multiple pieces of evidence to explain the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms; synthesize multiple sources of information about phenomena and an understanding of behaviors of organisms to determine that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or for storage as memories. (LS1)

- Analyze and interpret data about phenomena to provide evidence to explain multiple ways that resource availability affects populations, construct an argument supported by multiple pieces of evidence that populations are affected by changing physical and biological components of an ecosystem, develop and revise models to explain phenomena using an understanding of the cycling of matter and energy in an ecosystem, describe phenomena using an understanding of interactions among organisms and predict multiple patterns of interactions among organisms across multiple ecosystems, and evaluate multiple competing design solutions for phenomena that involve maintaining biodiversity in ecosystems. (LS2)
- Develop and use multiple models to explain phenomena using an understanding of how genetic mutations affect proteins resulting in harmful, beneficial, or neutral effects on an organism, and to explain phenomena using an understanding of how asexual reproduction results in offspring with identical genetic information and to explain how sexual reproduction results in offspring with genetic variation. (LS3)
- Analyze and interpret multiple pieces of data about phenomena using an understanding of the fossil record and modern organisms to show patterns in the change of life forms over time, apply multiple scientific ideas about phenomena to construct an explanation for the anatomical similarities and differences among modern and fossil organisms to infer evolutionary relationships, analyze pictorial data to compare similarities in embryological development across multiple familiar and unfamiliar species to identify evolutionary relationships, use multiple pieces of evidence and mathematical representations to explain phenomena using an understanding of how variation in genetic traits provides advantages to some individuals within a population and to support explanations of increases and decreases in specific traits over time, and explain phenomena by synthesizing multiple pieces of information about ways technologies have changed the way humans influence the inheritance of desired traits in organisms. (LS4)
- Develop, use, and revise a model of the Earth-Sun-Moon system to describe phenomena using an understanding of the cyclic pattern of the seasons and to describe phenomena using an understanding of the role of gravity in the motions within the solar system and galaxies, analyze and interpret data on multiple phenomena related to the scale properties of objects in the solar

system, and use multiple pieces of evidence and an understanding of rock strata to explain phenomena about how the geologic time scale is used to organize Earth's history. (ESS1)

- Develop models to describe phenomena using an understanding of the flow of energy that drives the cycling of Earth's materials, use multiple pieces of evidence to explain phenomena using an understanding of how geoscience processes have changed Earth's surface at varying time and spatial scales, analyze and interpret multiple pieces of data to explain phenomena using an understanding of the evidence that supports past plate motions on Earth, develop models to describe phenomena using an understanding of the water cycle including energy and gravity, explain weather phenomena synthesizing and using evidence and an understanding of the interactions of air masses, and develop and use models to describe phenomena using an understanding of how unequal heating and Earth's rotation result in climate, atmospheric, and ocean circulation patterns. (ESS2)
- Use evidence to explain multiple phenomena using an understanding of how geoscience processes have resulted in uneven distribution of Earth's natural resources, analyze and interpret multiple pieces of data on natural hazard phenomena to forecast future catastrophic events and to inform the development of technologies to mitigate their effects, apply scientific principles to design a successful solution for monitoring and minimizing the human impacts on the environment, describe multiple advantages and disadvantages associated with phenomena related to the technology of local industries and energy production, use multiple pieces of evidence to support an argument about phenomena using an understanding of how increases in human population impact Earth's systems, and ask multiple questions about phenomena to clarify evidence of multiple factors that have caused the rise in global temperatures. (ESS3)
- Define the criteria and constraints of a design problem with sufficient precision to ensure an optimal solution and using an understanding of scientific principles and potential impacts on people and the environment and an understanding of how those impacts may limit possible solutions, use a systematic process to evaluate how well multiple competing design solutions meet required criteria and constraints, analyze data from tests of multiple different design solutions to identify the best characteristics of each solution that can be combined into a new solution that will better meet criteria for success, and develop a realistic model of a proposed object, tool, or process that generates data while it is repeatedly tested and modified until an optimal design is achieved. (ETS1)

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:

- Develop and use models to describe phenomena using an understanding of the structure of matter; to predict and describe phenomena using an understanding of changes in particle motion and state; and to describe phenomena using an understanding of conservation of mass during one or two physical and chemical changes. (PS1)
- Plan and carry out investigations to produce data and/or provide evidence about phenomena using an understanding of the effects of forces, interactions, and mass on the motion of objects, as well as use direct data to support claims about phenomena using an understanding of gravitational interactions in systems and to design a solution to a problem using an understanding of systems of colliding objects. (PS2)
- Plan investigations, use data, and develop or use models to describe phenomena using an understanding of relationships involving kinetic and potential energy in systems, as well as apply such understanding to design and test devices to solve problems related to energy transfer and to support claims about phenomena related to energy transfer. (PS3)
- Use mathematical representations and patterns, and develop and use models, to describe phenomena using an understanding of wave properties and relationships and wave interactions with various materials, and use multiple sources of information and an understanding of signal types to support claims about phenomena related to reliability of digital and analog signals. (PS4)
- Use one or two pieces of evidence from investigations of phenomena to explain that living things are made of cells, develop and use models of phenomena to describe the function of a cell and its parts and to describe how food is rearranged in organisms through chemical reactions to support growth and/or release energy, support arguments about phenomena using one or two pieces of evidence and an understanding that the body is a system of interacting subsystems composed of cells, support an explanation for how some animal behaviors and some specialized plant structures affect the probability of reproductive success, use one or two pieces of evidence and an understanding of environmental and genetic factors to explain phenomena about how those factors influence the growth of organisms, construct an explanation based on one or two pieces of evidence to explain the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms, use information about phenomena and an understanding of behaviors of organisms to determine that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or for storage as memories. (LS1)

- Analyze and interpret data about phenomena to provide evidence to explain one or two ways that resource availability affects populations, construct an argument supported by one or two pieces of evidence that populations are affected by changing physical or biological components of an ecosystem, develop models to describe phenomena using an understanding of the cycling of matter and energy in an ecosystem, describe phenomena using an understanding of interactions among organisms and predict one or two patterns of interactions among organisms across multiple ecosystems, and evaluate two competing design solutions for phenomena that involve maintaining biodiversity in ecosystems. (LS2)
- Develop and use one or two models to explain phenomena using an understanding of how genetic mutations affect proteins resulting in harmful, beneficial, or neutral effects on an organism and to explain phenomena using an understanding of how asexual reproduction results in offspring with identical genetic information and how sexual reproduction results in offspring with genetic variation. (LS3)
- Analyze and interpret one or two pieces of data about phenomena using an understanding of the fossil record and modern organisms to show patterns in the change of life forms over time, apply one or two scientific ideas about phenomena to construct an explanation for the anatomical similarities and differences among modern and fossil organisms to infer evolutionary relationships, analyze pictorial data to compare similarities in embryological development across multiple familiar species to identify evolutionary relationships, use one or two pieces of evidence or mathematical representations to explain phenomena using an understanding of how variation in genetic traits provides advantages to some individuals within a population and to support explanations of increases and decreases in specific traits over time, and explain phenomena by synthesizing one or two pieces of information about technologies that have changed the way humans influence the inheritance of desired traits in organisms. (LS4)
- Develop and use a model of the Earth-Sun-Moon system to describe phenomena using an understanding of the cyclic pattern of the seasons and to describe phenomena using an understanding of the role of gravity in the motions within the solar system and galaxies, analyze and interpret data on one or two phenomena related to the scale properties of objects in the solar system, and use one or two pieces of evidence and an understanding of rock strata to explain phenomena about how the geologic time scale is used to organize Earth's history. (ESS1)
- Develop and use a model of the Earth-Sun-Moon system to describe phenomena using an understanding of the cyclic pattern of the seasons and to describe phenomena using an understanding of the role of gravity in the motions within the solar system and galaxies, analyze and interpret data on one or two phenomena related to the scale properties of objects in the solar system, and use one or two pieces of evidence and an understanding of rock strata to explain phenomena about how the geologic time scale is used to organize Earth's history. (ESS2)
- Use evidence to explain one or two phenomena using an understanding of how geoscience processes have resulted in uneven distribution of Earth's natural resources, analyze and

interpret one or two pieces of data on natural hazard phenomena to forecast future catastrophic events and to inform the development of technologies to mitigate their effects, apply scientific principles to design a solution for monitoring and minimizing human impacts on the environment, describe one or two advantages and disadvantages associated with phenomena related to the technology of local industries and energy production, use one or two pieces of evidence to support an argument about phenomena using an understanding of how increases in human population impact Earth's systems, and ask one or two questions about phenomena to clarify evidence of one or two factors that have caused the rise in global temperatures. (ESS3)

- Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution and using an understanding of scientific principles and potential impacts on people and the environment and an understanding of how those impacts may limit possible solutions, use a systematic process to evaluate how well two competing design solutions meet required criteria and constraints, analyze data from tests of two different design solutions to identify the best characteristics of each solution that can be combined into a new solution that will better meet criteria for success, and develop a model of a proposed object, tool, or process that generates data while it is repeatedly tested and modified until an optimal design is achieved. (ETS1)

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 models to identify the structure of matter as it relates to phenomena; to describe basic phenomena using an understanding of changes in particle motion and state; and to identify that mass is conserved during physical or chemical changes that take place in various phenomena. (PS1)
- Identify or describe parts of investigations about phenomena using an understanding of the effects of forces, interactions, and mass on the motion of objects, describe aspects of phenomena using one or two pieces of data and an understanding of one gravitational

interaction in a system, and identify a design or elements of a solution to a problem related to colliding objects. (PS2)

- Describe parts of investigations, use data, and use models to describe aspects of phenomena using an understanding of some relationships involving kinetic energy in systems; design and test a device for problems related to energy transfer; and identify principles that support claims about energy transfer in phenomena. (PS3)
- Use mathematical representations, patterns, and models to identify wave properties and wave interactions with various materials as they relate to phenomena and use one or two sources of information to identify that digital signals are more reliable than analog signals as demonstrated in various phenomena. (PS4)
- Use evidence from an investigation of a phenomenon to explain that living things are made of cells, use models of phenomena to describe the function of a cell and some of its parts and to describe that food is rearranged in organisms into new substances to support growth or to release energy, make claims about phenomena using evidence and a partial understanding that the body is a system of interacting subsystems composed of cells, describe some animal behaviors or specialized plant structures that may affect reproductive success, use evidence and a partial understanding of environmental or genetic factors to describe phenomena about how those factors influence the growth of organisms, construct an explanation based on one piece of evidence to describe the role of photosynthesis in the cycling of matter or flow of energy into and out of organisms, and use information about phenomena to describe that organisms use their senses to respond to stimuli immediately or to store information as memories. (LS1)
- Use data about phenomena to describe one way resource availability affects populations, make a claim supported by evidence that populations are affected by changing components of an ecosystem, use models to describe phenomena about the cycling of matter or energy in an ecosystem, use a partial understanding of interactions among organisms to describe one interaction between organisms, and describe a design solution or components of a solution for phenomena that involve maintaining biodiversity in ecosystems. (LS2)
- Use models to partially explain phenomena using an understanding of one way that genetic mutations affect organisms and to describe phenomena using an understanding of asexual reproduction resulting in offspring with identical genetic information, or about sexual reproduction resulting in offspring with genetic variation. (LS3)
- Use data about phenomena using a partial understanding of the fossil record and modern organisms to show patterns in the change of life forms over time, apply a scientific idea about phenomena to describe an anatomical similarity or difference between modern and fossil organisms, use pictorial data to describe similarities in embryological development across multiple species, use evidence or one mathematical representation to describe phenomena using a partial understanding of variation in genetic traits among individuals within a population or to describe increases and decreases in specific traits over time, and describe phenomena

using a partial understanding about technologies that have changed the way humans influence the inheritance of desired traits in organisms. (LS4)

- Use a model of the Earth-Sun-Moon system to describe phenomena using a partial understanding of the cyclic pattern of the seasons and to describe phenomena using a partial understanding of the role of gravity in the motions within the solar system or galaxies, use data on phenomena related to the scale properties of objects in the solar system, and use evidence and a partial understanding of rock strata to describe some aspects about how the geologic time scale is related to Earth's history. (ESS1)
- Use a model to describe phenomena using a partial understanding of the flow of energy that drives the cycling of Earth's materials, use evidence to explain phenomena using a partial understanding of how geoscience processes have changed Earth's surface, use data to explain phenomena using a partial understanding of the evidence that supports past plate motions on Earth, use a model to describe phenomena using an understanding of the water cycle, describe weather phenomena using evidence and a partial understanding of the interactions of air masses, and use a model to describe phenomena using an understanding of how unequal heating and Earth's rotation result in some climate, atmospheric, or ocean circulation patterns. (ESS2)
- Use evidence to explain a phenomenon using a partial understanding of how geoscience processes have resulted in uneven distribution of some of Earth's natural resources, use data on natural hazard phenomena to forecast future catastrophic events or to inform the development of one technology that could be used to mitigate their effects, identify human impacts on the environment or design parts of a solution for monitoring or minimizing the human impacts, identify an advantage or a disadvantage associated with phenomena related to the technology of local industries and energy production, use evidence to make a claim about phenomena using a partial understanding of how increases in human population impact Earth's systems, and ask one question about a phenomenon to clarify evidence of one factor that has caused the rise in global temperatures. (ESS3)
- Define one criterion or constraint of a design problem using an understanding of scientific principles and/or potential impacts on people and the environment and identify one way those impacts may limit possible solutions, use a systematic process to evaluate how well a design solution meets required criteria or constraints, analyze data from tests of a design solution to identify a characteristic of the solution that is necessary to meet the criteria for success, and develop a partial model of a proposed object, tool, or process that can be tested and modified. (ETS1)

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