Date: October 24, 2017
Prepared By: Force
Notice of Proposed Rulemaking (NPRM): New Mexico STEM-Ready Science Standards

Proposed Rule Abstract

1. **Agency:** Public Education Department (PED)
2. **Rule Citation:** 6.29.10 NMAC
3. **Rulemaking Action:** Repeal and Replace
4. **Register Issue and Date of NPRM:** Volume 28, Issue 17, September 12, 2017
5. **Effective date:** July 1, 2018
6. **Specific Legal Authority:** Sections 22-2-2 and 22-2C-3 NMSA 1978
7. **Purpose of Rule:** Provide teachers with updated science standards aligned with both national standards and New Mexico-specific content.
8. **Rulemaking Information Contact:** Jamie Gonzalez, Policy Division, NM PED, Room 101, 300 Don Gaspar Ave., Santa Fe, NM 87501; 505-827-7889; rule.feedback@state.nm.us
9. **Comment Period:** September 12, 2017 to through 5:00 p.m. on October 16, 2017
10. **Rule Hearing:** October 16, 2017, 9:00 a.m. through 12:00 p.m., Jerry Apodaca Building, 300 Don Gaspar Ave., Santa Fe, NM 87501

Rule Summary

The September 12, 2017 issue of the *New Mexico Register* contained the proposed repeal of New Mexico's current standards and benchmarks for science education, to be replaced by the New Mexico STEM-Ready Science Standards, a modified version of the Next Generation Science Standards (NGSS) that were created by 26 "Lead State Partners" in collaboration with the National Science Teachers Association, the American Association for the Advancement of Science, the National Research Council, and Achieve. Modifications add language that deals with the application of NGSS to situations particular to New Mexico, and change some language found in the NGSS related to evolution, the age of the earth, and climate change standards. See **Attachment 1, Proposed New Mexico STEM-Ready Science Standards**, and **Attachment 2, Integrated New Mexico STEM-Ready Science Standards**.

Analysis

New Mexico Science Content Standards, Benchmarks, and Performance Standards. The current New Mexico standards were adopted in 2003 and have been in place for 14 years without a substantive review or change. The last scheduled review of the science standards was in 2010, but it was not done, as PED decided to wait until the promulgation of the Next Generation Science Standards in 2013. PED's Math and Science Advisory Council recommended full adoption of the NGSS in 2015, without change.

During the 2017 regular legislative session, House Bill 211 (HB211) was introduced directing PED to adopt the NGSS by August 31, 2017. By July 31, 2018, the department was to have developed a plan to promulgate rules for the NGSS, with the advice and help of the Math and Science Advisory Council, with local school districts and charter schools to begin full implementation of the new standards in the 2018-2019 school year. The legislation passed both chambers on a party-line vote and the governor vetoed the measure, noting that PED had been working on the standards and that specific standards and benchmarks do not belong in statute, because PED recommends review and adoption of standards in every academic content area on a six-year cycle; HB211, mandating adoption of the NGSS, might have impeded this normal review and adoption process.

Next Generation Science Standards. The NGSS began with the National Research Council's work in 2010 to create a conceptual framework to guide the development of the new standards, with an eye toward preparing students for work and careers in the science, technology, engineering, and math (STEM) fields. In 2011, the standards' conceptual framework was developed to address four disciplines within the sciences – physical sciences; life sciences; earth and space sciences; and engineering, technology and application – viewed through three dimensions of study: the core principals of the four disciplines, scientific and engineering practices, and crosscutting concepts that unify science and engineering. As noted, several national organizations and 26 states worked together to write the actual standards, and after several drafts the final standards were unveiled in April of 2013.

The New Mexico STEM-Ready Science Standards.

Organization and Structure. The proposed New Mexico STEM-Ready Science Standards parallel the structure of the NGSS. Each standard is identified by an alphanumeric code that indicates the standard's grade level or grade span, its branch of the sciences, and the branch subcategory. There are separate standards for each grade from kindergarten through fifth grade, and grouped standards for both middle school (sixth through eighth grades) and high school (ninth through 12th grades). Like the NGSS, each of these standard refers to one of the four scientific disciplines. Engineering technology standards are always grouped by grade span, either kindergarten through second grade, third through fifth grade, middle school, or high school. A numeric reference follows, indicating the particular subcategory of the discipline, followed by the number of the particular standard within that group.

In the NGSS coding system, Standard K-PS3-1 refers to the first kindergarten standard in the third physical science subcategory of "Energy." Similarly, 3-5-ETS1-2 refers to the second engineering technology standard for the third through fifth grade group (engineering technology standards have no subcategory).

The proposed rule adds several standards specific to New Mexico. Most of these are sub-standards that refer to New Mexico-specific issues, and are noted with the addition of "NM" at the end of the main standard's label. For example, Standard 5-ESS2-1, the first fifth-grade standard in the second earth and space sciences subcategory of "Earth Systems," reads, "Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact," while the additional Standard 5-ESS2-1 NM reads, "Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact in New Mexico." Both of these standards are included in the proposed standards.

The proposed standards also include several that are specific to New Mexico only. Those are indicated by the inclusion of "NMSS," meaning "New Mexico science and society," in the standard's code where the scientific discipline would otherwise be noted. Thus, HS-NMSS-2 refers to the second high school standard in "New Mexico science and society."

Comparison of New Mexico STEM-Ready Science Standards with Next Generation Science Standards. As noted, PED has proposed standards for New Mexico that are close to the NGSS as they were originally developed, but with some changes. See **Attachment 3, Comparison of NGSS and New Mexico STEM-Ready Science Standards**. Many of the changes involve the addition of the New Mexico-specific standards, but some of these changes alter the content of particular next generation standards; the altered standards address issues such as planetary formation, evolution, and climate change.

Only one Next Generation Science Standard was eliminated entirely from the New Mexico STEM-Ready Science Standards, Standard MS-LS4-3, the third standard in the life sciences category, "Biological Evolution: Unity and Diversity." It read, "Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy."

Other NGSS standards that have been changed include references to the age of the Earth, global temperature changes, evolutionary processes, and the impact of human activities on the environment, as follows:

- Standard MS-ESS1-4. A reference to the age of the earth was changed from "4.6-billion-year-old history" to "geologic history."
- Standard MS-ESS3-3. Direction to design a method for "monitoring and minimizing a human impact on the environment" was rewritten to require the design of a method of "monitoring, evaluating, and managing a human impact on the environment."
- Standard MS-ESS3-5. A mention of "the rise in global temperatures" was changed to "fluctuations in global temperatures." (Similar language was used in the corresponding standard specific to New Mexico, MS-ESS3-5 NM.)
- Standard HS-LS4-1. The proposed standards add a requirement that students "analyze" and "interpret" evidence for the role of group behavior on individual and species' chances to survive and reproduce, in addition to "communicating" the evidence.
- Standard HS-LS4-2. Direction to construct an evidence-based explanation that "the process of evolution primarily results from four factors" was changed to construct an explanation that "biological diversity is influenced by [four factors]."
- Standard HS-ESS2-7. A requirement that students construct an evidence-based argument about the "simultaneous co-evolution of Earth's systems and life on Earth," was changed to require the construction of an argument only about the "evolution of Earth's systems and life on Earth."

- Standard HS-ESS3-5. Direction to "analyze geoscience data" to make an evidence-based forecast of the "current rate of global or regional climate change" was rewritten to require analysis of unspecified "data" to forecast the "rate of global climate fluctuation."
- Standard HS-ESS3-6. A requirement that students use a computational representation to illustrate how the relationships among Earth's systems are being modified "due to human activity" was altered to leave out the reference to "human activity."

It should be noted that, after the public rule hearing held on Monday, October 16, 2017, PED released a statement that it was planning to revise the proposed standards to include previously altered concepts. With that statement, they released four exemplary standards with updated language: MS-ESS1-4, MS-ESS3-5, HS-LS4-2, and HS-ESS3-5. See below for these standards and PED's response to public comment.

Comparison of New Mexico STEM-Ready Science Standards with Current State Standards. A direct side-by-side comparison of these two sets of standards is problematic, as they are structured and organized in completely different fashion. However, a review of the concepts in current state standards that were most changed in the New Mexico STEM-Ready Science Standards may serve as a useful comparison:

- The age of the earth and the universe is rendered in billions of years several times in reference to the length of time that life has been present on the earth, the Big Bang theory, and the Earth's formation.
- The concept of evolution is mentioned frequently in reference to the basic concept itself, heritable traits, examinations of the fossil record, speciation, natural selection, extinction, biodiversity, and mutation.
- Climate change is discussed in reference to the basic concept, the difference between climate and weather, and the confrontation of local, national, and global challenges related to climate change.

Overall, the current state science standards discuss these concepts more frequently and more directly than the proposed New Mexico STEM-Ready Standards. See **Attachment 4, Current New Mexico Science Standards: Review by Concept**.

Another notable difference between the current New Mexico science standards and benchmarks and both the New Mexico STEM-Ready Science Standards and the NGSS is the emphasis both NGSS and the proposed New Mexico standards place on critical thinking, practical application, the synergistic nature of the scientific disciplines, and connections to other fields of study, like mathematics. A focus of the NGSS and proposed standards is an emphasis on both conceptual and practical understanding of scientific principles. Performance expectations combine skills and ideas that students need to learn, while suggesting ways of assessing whether students understand the components of each standard.

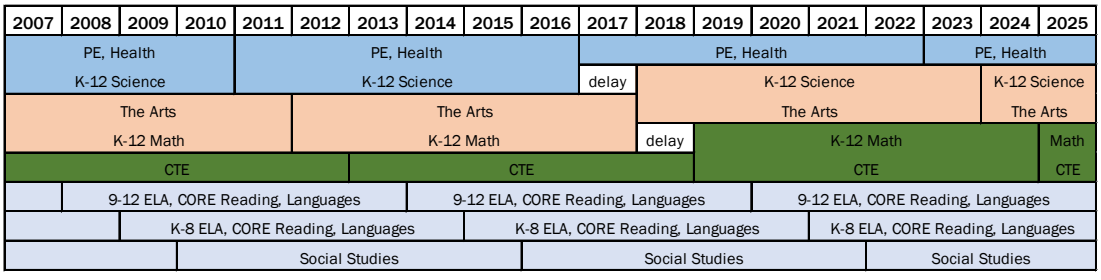
While each standard appears in the rule as a single concept, as noted above, each includes: (1) components that reference specific engineering practices that emphasize practical application of skills and scientific method; (2) disciplinary core ideas that denote the concept at the heart of the standard to be understood; and (3)

cross-cutting concepts that connect to other scientific principals and disciplines. These elements of the standards are not readily evident in the rule, but are included on the NGSS website for greater understanding, discussion, and application of each standard, and can be found by selecting and clicking on specific standards. Also included in each standard are other, related disciplinary core ideas at both the same grade level and other grade levels, as well as related standards of English language arts and mathematics from the Common Core State Standards.

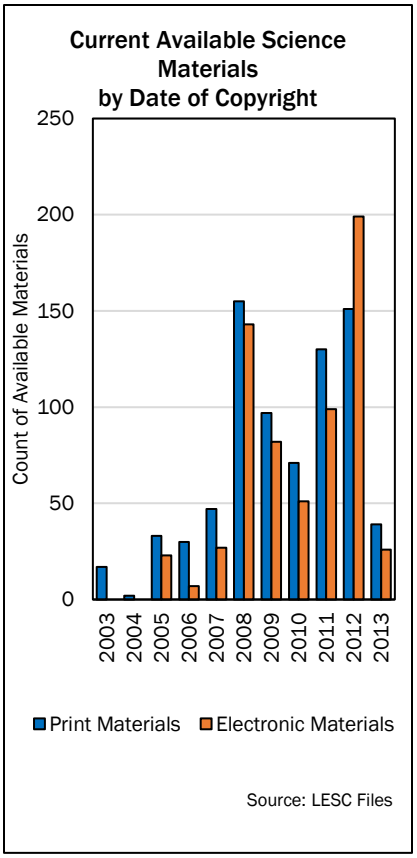
The current New Mexico science standards focus on what students are to "know" or "understand," while the NGSS and New Mexico STEM-Ready Science Standards focus on what students should be able to *do* to demonstrate understanding of a principal and to show the standard has been met. Verbs used in directions of the current New Mexico standards include "observe," "describe," "identify," and "know," with the occasional inclusion of more active verbs. The NGSS, on the other hand, employ a wider variety of more actively engaged directions, such as "plan and conduct," "analyze," "construct," "communicate," "use a model," and "develop," all of which emphasize a more active learning process and demonstration of understanding. The engineering, technology, and application requirements laid out for each grade span further emphasize the practical use of skills and knowledge to demonstrate understanding, rather than rote recitation or successful completion of written examinations and assignments.

Instructional Materials Review, Adoption, and Appropriation. The next scheduled review of the science materials was to have been in the summer of 2017 for purchase of materials in the 2018-2019 school year, but according to PED's Instructional Material Bureau (IMB), the science review was delayed by one year to save money. Science materials previously scheduled to be adopted in 2017 are now scheduled for adoption in 2018 and funding for science materials will be appropriated in the 2019 legislative session for purchase of science instructional materials in the 2019-2020 school year. PED has currently proposed a full implementation date of the 2018-2019 school year for the proposed New Mexico STEM-Ready Science Standards, raising concerns about the alignment of the adoption cycle with the time period in which school districts and charter schools must begin teaching the standards. Aligned instructional materials will not be available to purchase until the second year of implementation of the new standards.

Current Instructional Materials Adoption Cycles By Year of Adoption



Source: PED Instructional Material Bureau



According to PED's multiple list of approved adopted materials, a majority of the science textbooks available for adoption were published between 2008 and 2012. Elementary science materials make up more than half of the available materials for purchase. On average, the subject with the "oldest" age is health science with a median publishing year of 2007. Other subjects like geology, environment and ecology, and anatomy have median publishing years of 2012, but only consist of a small number of available materials. For instance, there is only one approved geology textbook available for purchase. The New Mexico STEM-Ready Science Standards are very different than the current state standards, and may require a large appropriation to purchase new textbooks aligned to the new standards.

The adoption of science materials historically has been one of the more expensive instructional material adoption cycles. The most recent adoption cycle of science materials for New Mexico students made science instructional materials available for purchase in the 2013-2014 school year. Both the FY13 PED appropriation request and Legislative Finance Committee (LFC) budget recommendation for instructional materials totaled $28.5 million; the Legislature appropriated $27 million in recurring general fund revenue and supplemented that with an additional $1.5 million Section 5 special nonrecurring appropriation. The FY07 appropriation for science materials totaled $33 million, $3.1 million less than PED requested and $2.5 million less than LFC recommended.

Current appropriations for instructional materials are significantly less than they were before the Great Recession and have not returned to pre-recession levels because other appropriations have been prioritized by the Legislature and executive. Between FY03 and FY09, annual appropriations for instructional materials averaged $32.7 million, while annual appropriations for instructional materials have averaged just $18 million a year between FY10 and FY18. For FY18, the Legislature only appropriated $10 million to the instructional material fund from the public school capital outlay fund. It is unclear what the total funding need will be in FY20 to fully fund the science adoption cycle and allow school districts and charter schools to purchase high-quality, aligned instructional materials; however, it is likely similar to the pre-recession appropriation levels.

Other Financial Considerations. As policymakers consider future appropriations, it will be important for them to consider that science test scores will be incorporated into school grades beginning with the 2019-2020 school year, and school grades will be the key indicator that identifies low-performing schools for intervention. If schools do not have the materials they need to effectively teach the new standards, school grades could be negatively impacted. Additionally, there may be a need for an appropriation to provide statewide professional development to teachers to ensure they are prepared to effectively teach the new standards. After the adoption of the Common Core State Standards in 2010, the Legislature appropriated $1 million for use in FY12 and FY13 and $1.5 million for use in FY13 and FY14 to support transition to the Common Core State Standards. Transition to the New Mexico STEM-Ready Science Standards may require similar additional appropriations.

Adoption of new content standards will also require the development of a new science standards-based assessment for fourth, eighth, and 11th grades. It is unclear if federal funds will be made available for assessment development similar to PARCC and Smarter Balanced consortium assessments. In those instances, the federal government made $350 million available to the consortiums to develop assessments aligned to the Common Core State Standards. It is unclear if New Mexico would be able to take advantage of any consortium-developed assessment, or NGSS-aligned assessment developed by another state because of the state's deviation from the NGSS standards. PED has not provided a current cost estimate for developing an assessment aligned to the New Mexico STEM-Ready Science Standards.

Rule Hearing and Other Public Comment

Rule Hearing. The October 16, 2017 rule hearing ran most of the day and was very well attended, with attendees easily exceeding the capacity of the room. While representation at the hearing leaned heavily toward educators and scientists, there were many others in attendance. The hearing officer indicated that, initially, there were approximately 250 commenters signed up to speak, although after some attrition due to the long afternoon, a fire alarm, and unanimity and repetition of comments, only 77 speakers gave oral public testimony. All commenters were opposed to the NGSS standards being altered. In advance of the public rule hearing, 61 scientists and engineers from Los Alamos National Laboratory (LANL) published an open letter to PED as a full-page advertisement protesting the adoption of the proposed standards; the letter was also submitted as formal comment on the rulemaking. See **Attachment 5, Letter from 61 LANL Scientists and Engineers**.

Attendees at the hearing included:

- scientists, educators, and attorneys;
- New Mexico state legislators;
- parents and students;
- clergy;
- union and other nonprofit representatives, such as the League of Women Voters;
- medical doctors;
- tribal teachers; and
- representatives of the Math and Science Advisory Council, the Los Alamos National Lab Foundation, and NM TEACH Plus.

Comments were generally aligned with certain themes or broad points. All speakers recommended adoption of the NGSS without alteration, as the New Mexico STEM-Ready Science Standards diminish the key concepts of evolution, climate change, and the age of the Earth. Witnesses also expressed concern with PED's process for proposing the standards, decrying the lack of transparency evident in the Secretary-Designate's refusal to name those with whom he consulted to arrive at the NM-STEM Ready standards, as well as his absence from the proceedings. Others were concerned with the possible political, economic, or religious reasons for altering standards that are appropriately based on pure science without social considerations, noting potential violations of the constitutional Establishment Clause. Some commenters emphasized the practical need for a scientifically literate population, able to attract science-and-technology-focused employers and enrich the state and local economies. Others spoke of the implementation issues addressed above, such as the lack of aligned materials and professional development resulting from the stated effective date of FY19. Representative Bill McCamley submitted a letter recommending full adoption of the NGSS with 85 signatories; the representative, with

The Establishment and Free Exercise Clauses of the United States Constitution bar the government from mandating any religion, or supporting any religion over any other. Some commenters at the rule hearing were concerned that the insertion of apparently biblical considerations into the science standards would violate those constitutional provisions.

Representatives Andrés Romero and Christine Trujillo, sponsored HB211, which mandated the adoption of NGSS.

Other Public Comment. The comments made at the rule hearing were in line with other submitted written comments. Scientific and business organizations such as the New Mexico Association of Commerce and Industry, New Mexico Science Teachers' Association, the Los Alamos Commerce and Development Corporation, the LANL Foundation, all submitted comments to PED opposing the adoption of the New Mexico STEM-Ready Science Standards. Educator groups and unions also submitted written comments. The National Education Association – New Mexico sent a letter template to its members, and as of October 18, 2017, 64 members had submitted it as public comment opposing the proposed standards. The Albuquerque Teachers Federation submitted a letter with 500 signatures, as did NM TEACH Plus, an organization that provides fellowships in education policy to teachers, and in the past worked on the teacher evaluation system.

PED Response to Hearing and Comment. On Sunday, October 15, 2017, just prior to the public hearing and the close of the comment period, Secretary-Designate Ruszkowski published an editorial in the *Albuquerque Journal* in which he continued to promote the "flexibility" of the proposed New Mexico STEM-Ready Science Standards to incorporate "community values" in teachers' lesson plans. See **Attachment 6, Secretary-Designate C. Ruszkowski Editorial**. On the evening of Tuesday, October 17, however, the Secretary-Designate released a statement indicating that public comment had moved the department to revise its proposed standards to include previously omitted references to "the 4.6 billion-year-old history of the Earth, the rise in global temperatures, and the process of evolution due to genetic variation." See **Attachment 7, PED Response to Public Comment.** While PED has not released a new draft of the New Mexico STEM-Ready Science Standards, they did publish four of the standards (two for middle school and two for high school) that showed the proposed standards as identical to their NGSS counterparts. They appear below in strikeout/underline format to show changes back to the original NGSS language:

1. **MS-ESS1-4**: Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's ~~geologic~~ 4.6-billion-year-old history.
2. **MS-ESS3-5**: Ask questions to clarify evidence of the factors that have caused the ~~fluctuation~~ rise in global temperatures over the past century.
3. **HS-LS4-2:** Construct an explanation based on evidence that biological diversity ~~is influenced by~~ primarily results from four main factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
4. **HS-ESS3-5:** Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate ~~fluctuation~~ change and associated future impacts to Earth systems.

No mention of the 35 additional New Mexico-specific standards was included in the statement. Thus far, there has been no indication that PED would adopt the NGSS completely as written, as public comment has requested. PED has not given any indication of whether the revised standards will be offered as a new proposal with additional opportunity for public comment, or if they are only to be included in a final adoption of the proposed New Mexico STEM-Ready Science Standards.

Next Generation Science Standards in Other States. The NGSS have been adopted in their entirety by 14 of the 26 Lead State Partners, as well as by another four states and the District of Columbia, bringing the total number of United States jurisdictions with NGSS to 19. Another three states have adopted standards similar to NGSS, while others have created their own standards. Additionally, according to Education Week, several states that allow districts to exercise local control over curriculum and standards are seeing partial adoption of NGSS. Individual school districts in Florida, Missouri, Nebraska, Pennsylvania, Wisconsin, and Wyoming have adopted and begun implementing NGSS independently. Often, political pressures in these states prevent the NGSS from becoming a statewide curriculum. For instance, in Wyoming, the state initially placed a ban on adoption of NGSS. After the ban was lifted, 15 school districts adopted the standards. Louisiana adopted new standards that are similar to NGSS, but deviate from NGSS more than New Mexico's proposed standards. Louisiana educators wrote their standards from scratch, drawing inspiration from NGSS, but also including standards particular to Louisiana's unique climate and geography.

Texas recently approved an update to their current science standards, to be implemented in the 2018-2019 school year. The major purpose of the revisions is to streamline and condense the state's current lengthy standards. Similar to the current New Mexico standards, the previous Texas standards include several specific mentions of evolution, climate change, and the human impact on climate change. The newly adopted standards do not mention climate change and contain only one standard referencing the theory of evolution.

Lead State Partners Source: NGSS	**Adopted** Source: NSTA	**Adopted Similar** Source: Ed Week
Arizona		
Arkansas	Arkansas	
California	California	
Delaware	Delaware	
Georgia		
Illinois	Illinois	
Iowa	Iowa	
Kansas	Kansas	
Kentucky	Kentucky	
Maine		
Maryland	Maryland	
Massachusetts		
Michigan	Michigan	
Minnesotta		
Montana		Montana
New Jersey	New Jersey	
New York		
North Carolina		
Ohio		
Oregon	Oregon	
Rhode Island	Rhode Island	
South Dakota		South Dakota
Tennessee		
Vermont	Vermont	
Washington	Washington	
West Virginia		West Virginia
	Connecticut	Wyoming
	D.C.	Louisiana
	Hawaii	
	New Hampshire	
	Nevada	

Supports for States that Adopt Next Generation Science Standards. The NGSS website includes a set of resources designed to help states implement NGSS, including sections on lessons learned from early adopters, an adoption and implementation

workbook, a guide with research-based recommendations for implementation from the National Research Council, among many other guides. The website also includes guides on evaluating the compliance of instructional materials with NGSS. These resources are available free of charge on the NGSS website to any state, school district, or individual, whether they adopt the NGSS or not. Because the materials are designed for NGSS as a whole, it is unclear whether they will be helpful for implementation or assessment of an edited version of NGSS, especially since they likely don't contain information pertinent to the standards authored specifically for New Mexico.

Technical Issues

Standard HS-ESS2-4 NM is an incomplete sentence. "Use a model to describe how variations in the flow of energy into and out of Earth's systems that were caused by natural occurrences that are not related to human activity." The second clause either lacks a verb or improperly includes an instance of the word, "that."

Several instances of proper personal names were not capitalized. Standards HS-PS2-1 and HS-PS2-4 both refer to Newton's laws, and in both cases "Newton" was not capitalized. Additionally, HS-PS2-4 included a reference to Coulomb's Law where "Coulomb" was also rendered in all lowercase letters.

TITLE 6 PRIMARY AND SECONDARY EDUCATION
CHAPTER 29 STANDARDS FOR EXCELLENCE
PART 10 SCIENCE

6.29.10.1 ISSUING AGENCY: Public Education Department, hereinafter the department.
[6.29.10.1 NMAC - Rp, 6.29.10.1 NMAC, 07/01/2018]

6.29.10.2 SCOPE: All public schools, state educational institutions and educational programs conducted in state institutions other than New Mexico military institute.
[6.29.10.2 NMAC - Rp, 6.29.10.2 NMAC, 07/01/2018]

6.29.10.3 STATUTORY AUTHORITY:

A. Section 22-2-2 NMSA 1978 grants the authority and responsibility for the assessment and evaluation of public schools, state-supported educational institutions and educational programs conducted in state institutions other than New Mexico military institute.

B. Section 22-2-2 NMSA 1978 directs the department to set graduation expectations and hold schools accountable. Section 22-2C-3 NMSA 1978 requires the department to adopt academic content and performance standards and to measure the performance of public schools in New Mexico.
[6.29.10.3 NMAC - Rp, 6.29.10.3 NMAC, 07/01/2018]

6.29.10.4 DURATION: Permanent.
[6.29.10.4 NMAC - Rp, 6.29.10.4 NMAC, 07/01/2018]

6.29.10.5 EFFECTIVE DATE: July 1, 2018, unless a later date is cited at the end of a section.
[6.29.10.5 NMAC - Rp, 6.29.10.5 NMAC, 07/01/2018]

6.29.10.6 OBJECTIVE: [~~The New Mexico content standards with benchmarks and performance standards for science provide a framework of required knowledge and skills in this field. The content standards with benchmarks and performance standards for science were adopted in 1996 as part of 6.32 NMAC; they were replaced in 2003. They are mandated for grades K-12. For grades 9-12, three units in science shall be required, one of which shall have a laboratory component.~~] The department-approved New Mexico STEM-Ready Science standards provide a framework of required knowledge and skills in this field; they are mandated for grades K-12.
[6.29.10.6 NMAC - Rp, 6.29.10.6 NMAC, 07/01/2018]

6.29.10.7 DEFINITIONS: [RESERVED]

~~**[6.29.10.8 CONTENT STANDARDS WITH BENCHMARKS AND PERFORMANCE STANDARDS FOR SCIENCE, Grades K-4:**~~

~~**A.** Strand 1: Scientific thinking and practice. Content standard 1: Students will understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting and validating in order to think critically. Students will:~~

~~**(1)** grades K-4 benchmark 1: use scientific methods to observe, collect, record, analyze, predict, interpret and determine reasonableness of data;~~

~~**(a)** grade K performance standards:~~

~~**(i)** use observation and questioning skills in science inquiry (e.g., "What happens when something is pushed or pulled?");~~

~~**(ii)** ask and answer questions about surroundings and share findings with classmates;~~

~~**(iii)** record observations and data with pictures, numbers and symbols;~~

~~**(b)** grade 1 performance standards:~~

~~**(i)** make observations, develop simple questions and make comparisons of familiar situations (e.g., "What does the seed look like when it starts to grow?");~~

~~**(ii)** describe relationships between objects (e.g., above, next to, below) and predict the results of changing the relationships (e.g., "When that block moves, what will happen to the one next to it?");~~

~~**(c)** grade 2 performance standards:~~

~~**(i)** conduct simple investigations (e.g., measure the sizes of plants of the same kind that are grown in sunlight and in shade);~~
~~**(ii)** use tools to provide information not directly available through only the senses (e.g., magnifiers, rulers, thermometers);~~
~~**(iii)** make predictions based on observed patterns as opposed to random guessing;~~
~~**(iv)** follow simple instructions for a scientific investigation;~~
~~**(d)** grade 3 performance standards:~~
~~**(i)** make new observations when discrepancies exist between two descriptions of the same object or phenomenon to improve accuracy;~~
~~**(ii)** recognize the difference between data and opinion;~~
~~**(iii)** use numerical data in describing and comparing objects, events and measurements;~~
~~**(iv)** collect data in an investigation and analyze those data;~~
~~**(v)** know that the same scientific laws govern investigations in different times and places (e.g., gravity, growing plants);~~
~~**(e)** grade 4 performance standards:~~
~~**(i)** use instruments to perform investigations (e.g., timers, balances) and communicate findings;~~
~~**(ii)** differentiate observation from interpretation and understand that a scientific explanation comes in part from what is observed and in part from how the observation is interpreted;~~
~~**(iii)** conduct multiple trials to test a prediction, draw logical conclusions and construct and interpret graphs from measurements;~~
~~**(iv)** collect data in an investigation using multiple techniques, including control groups, and analyze those data to determine what other investigations could be conducted to validate findings;~~
~~**(2)** grades K-4 benchmark 2: use scientific thinking and knowledge and communicate findings;~~
~~**(a)** grade K performance standard: communicate observations and answer questions about surroundings;~~
~~**(b)** grade 1 performance standard: know that simple investigations do not always turn out as planned;~~
~~**(c)** grade 2 performance standards:~~
~~**(i)** understand that, in doing science, it is often helpful to work with a team and share findings;~~
~~**(ii)** make accurate observations and communicate findings about investigations;~~
~~**(d)** grade 3 performance standards:~~
~~**(i)** use a variety of methods to display data and present findings;~~
~~**(ii)** understand that predictions are based on observations, measurements and cause-and-effect relationships;~~
~~**(e)** grade 4 performance standards:~~
~~**(i)** communicate ideas and present findings about scientific investigations that are open to critique from others;~~
~~**(ii)** describe how scientific investigations may differ from one another (e.g., observations of nature, measurements of things changing over time);~~
~~**(iii)** understand how data are used to explain how a simple system functions (e.g., a thermometer to measure heat loss as water cools);~~
~~**(3)** grades K-4 benchmark 3: use mathematical skills and vocabulary to analyze data, describe patterns and relationships and communicate findings;~~
~~**(a)** grade K performance standard: observe and describe the relative sizes and characteristics of objects (e.g., bigger, brighter, louder, smellier);~~
~~**(b)** grade 1 performance standard: use numbers and mathematical language (e.g., "addition" instead of "add to," "subtraction" instead of "take away") to describe phenomena;~~
~~**(c)** grade 2 performance standards:~~
~~**(i)** record observations on simple charts or diagrams;~~

~~**(ii)** measure length, weight and temperature with appropriate tools and express those measurements in accurate mathematical language;~~

~~**(d)** grade 3 performance standards:~~

~~**(i)** use numerical data in describing and comparing objects, events and measurements;~~

~~**(ii)** pose a question of interest and present observations and measurements with accuracy;~~

~~**(iii)** use various methods to display data, present findings and communicate results in accurate mathematical language;~~

~~**(e)** grade 4 performance standards:~~

~~**(i)** conduct multiple trials using simple mathematical techniques to make and test predictions;~~

~~**(ii)** use mathematical equations to formulate and justify predictions based on cause-and-effect relationships;~~

~~**(iii)** identify simple mathematical relationships in a scientific investigation (e.g., the relationship of the density of materials that will or will not float in water to the density of water).~~

~~**B.** Strand 2: Content of science. Content standard 1. Physical science: Students will understand the structure and properties of matter, the characteristics of energy and the interactions between matter and energy. Students will:~~

~~**(1)** grades K-4 benchmark 1: recognize that matter has different forms and properties;~~

~~**(a)** grade K performance standards:~~

~~**(i)** observe that objects are made of different types of materials (e.g., metal, plastic, cloth, wood);~~

~~**(ii)** observe that different materials have different properties (e.g., color, odor);~~

~~**(b)** grade 1 performance standards:~~

~~**(i)** observe that the three states of matter (i.e., solids, liquids and gases) have different properties (e.g., water can be liquid, ice or steam);~~

~~**(ii)** describe simple properties of matter (e.g., hardness, flexibility, transparency);~~

~~**(c)** grade 2 performance standards:~~

~~**(i)** observe that properties of substances can change when they are mixed, cooled or heated (e.g., salt dissolves in water, ice melts);~~

~~**(ii)** describe the changes that occur when substances are heated or cooled and change from one state of matter to another (i.e., solid, liquid and gas);~~

~~**(d)** grade 3 performance standards:~~

~~**(i)** identify and compare properties of pure substances and mixtures (e.g., sugar, fruit juice);~~

~~**(ii)** separate mixtures based on properties (e.g., by size or by substance: rocks and sand, iron filings and sand, salt and sand);~~

~~**(e)** grade 4 performance standards:~~

~~**(i)** know that changes to matter may be chemical or physical, and when two or more substances are combined, a new substance may be formed with properties that are different from those of the original substances (e.g., white glue and borax, cornstarch and water, vinegar and baking soda);~~

~~**(ii)** know that materials are made up of small particles (atoms and molecules) that are too small to see with the naked eye;~~

~~**(iii)** know that the mass of the same amount of material remains constant whether it is together, in parts or in a different state;~~

~~**(2)** grades K-4 benchmark 2: know that energy is needed to get things done and that energy has different forms;~~

~~**(a)** grade K performance standard: observe how energy does things (e.g., batteries, the sun, wind, electricity);~~

~~**(b)** grade 1 performance standard: observe and describe how energy produces changes (e.g., heat melts ice, gas makes car go uphill, electricity makes television work);~~

~~**(c)** grade 2 performance standards:~~

~~**(i)** describe how heat can be produced (e.g., burning, rubbing, mixing some substances);~~

~~**(ii)** know that heat moves more rapidly in thermal conductors (e.g., metal pan) than in insulators (e.g., plastic handle);~~

~~**(iii)** describe the usefulness of some forms of energy (e.g., electricity, sunlight, wind, sound) and how energy (e.g., heat, light) can affect common objects (e.g., sunlight warms dark objects, heat melts candles);~~

~~**(iv)** observe that sound is made by vibrating objects and describe it by its pitch and loudness;~~

~~**(v)** recognize that moving objects carry energy (kinetic energy);~~

~~**(d)** grade 3 performance standards:~~

~~**(i)** understand that light is a form of energy and can travel through a vacuum;~~

~~**(ii)** know that light travels in a straight line until it strikes an object and then it is reflected, refracted or absorbed;~~

~~**(iii)** measure energy and energy changes (e.g., temperature changes);~~

~~**(iv)** construct charts or diagrams that relate variables associated with energy changes (e.g., melting of ice over time);~~

~~**(e)** grade 4 performance standards:~~

~~**(i)** identify the characteristics of several different forms of energy and describe how energy can be converted from one form to another (e.g., light to heat, motion to heat, electricity to heat, light or motion);~~

~~**(ii)** recognize that energy can be stored in many ways (e.g., potential energy in gravity or springs, chemical energy in batteries);~~

~~**(iii)** describe how some waves move through materials (e.g., water, sound) and how others can move through a vacuum (e.g., x-ray, television, radio);~~

~~**(iv)** demonstrate how electricity flows through a simple circuit (e.g., by constructing one);~~

~~**3)** grades K-4 benchmark 3: identify forces and describe the motion of objects;~~

~~**(a)** grade K performance standards:~~

~~**(i)** observe that things move in many different ways (e.g., straight line, vibration, circle);~~

~~**(ii)** know that pushing or pulling an object changes its position and motion (direction or speed);~~

~~**(b)** grade 1 performance standards:~~

~~**(i)** describe ways to make things move, what causes them to stop and what causes a change of speed or change of direction;~~

~~**(ii)** observe that gravity makes things fall to the ground unless something holds them up;~~

~~**(c)** grade 2 performance standards:~~

~~**(i)** describe how the strength of a push or pull affects the change in an object's motion (e.g., how a big or small push affects how high a swing rises);~~

~~**(ii)** observe that electrically-charged materials and magnets attract and repel each other, and observe their effects on other kinds of materials;~~

~~**(d)** grade 3 performance standards:~~

~~**(i)** recognize that magnets can produce motion by attracting some materials (e.g., steel) and have no effect on others (e.g., plastics);~~

~~**(ii)** describe how magnets have poles (N and S) and that like poles repel each other, while unlike poles attract;~~

~~**(iii)** observe that some forces produce motion without objects touching (e.g., magnetic force on nails);~~

~~**(iv)** describe motion on different time scales (e.g., the slow motion of a plant toward light, the fast motion of a tuning fork);~~

~~**(e)** grade 4 performance standards:~~

~~**(i)** know that energy can be carried from one place to another by waves (e.g., water waves, sound waves), by electric currents and by moving objects;~~

~~**(ii)** describe the motion of an object by measuring its change of position over a period of time;~~

~~**(iii)** describe how gravity exerts more force on objects with greater mass (e.g., it takes more force to hold up a heavy object than a lighter one);~~

~~**(iv)** describe how some forces act on contact and other forces act at a distance (e.g., a person pushing a rock versus gravity acting on a rock).~~

~~**C.** Strand 2: Content of science. Content standard 2. Life science: Students will understand the properties, structures and processes of living things and the interdependence of living things and their environments. Students will:~~

~~**(1)** grades K-4 benchmark 1: know that living things have diverse forms, structures, functions and habitats;~~

~~**(a)** grade K performance standards:~~

~~**(i)** identify major structures of common living organisms (e.g., stems, leaves and roots of plants; arms, wings and legs of animals);~~

~~**(ii)** Observe that differences exist among individual living organisms (e.g., plants, animals) of the same kind;~~

~~**(b)** grade 1 performance standards:~~

~~**(i)** know that living organisms (e.g., plants, animals) have needs (e.g., water, air, food, sunlight);~~

~~**(ii)** know that living organisms (e.g., plants, animals) inhabit various environments and have various external features to help them satisfy their needs (e.g., leaves, legs, claws);~~

~~**(iii)** describe the differences and similarities among living organisms (e.g., plants, animals);~~

~~**(iv)** observe that living organisms (e.g., plants, animals) have predictable but varied life cycles;~~

~~**(c)** grade 2 performance standards:~~

~~**(i)** observe that diversity exists among individuals within a population;~~

~~**(ii)** observe and describe various shapes of fungi;~~

~~**(iii)** know that bacteria and viruses are germs;~~

~~**(d)** grade 3 performance standards:~~

~~**(i)** know that an adaptation in physical structure or behavior can improve an organism's chance for survival (e.g., horned toads, chameleons, cacti, mushrooms);~~

~~**(ii)** observe that plants and animals have structures that serve different functions (e.g., shape of animals' teeth);~~

~~**(iii)** classify common animals according to their observable characteristics (e.g., body coverings, structure);~~

~~**(iv)** classify plants according to their characteristics (e.g., tree leaves, flowers, seeds);~~

~~**(e)** grade 4 performance standards:~~

~~**(i)** explain that different living organisms have distinctive structures and body systems that serve specific functions (e.g., walking, flying, swimming);~~

~~**(ii)** know that humans and other living things have senses to help them detect stimuli, and that sensations (e.g., hunger) and stimuli (e.g., changes in the environment) influence the behavior of organisms;~~

~~**(iii)** describe how roots are associated with the intake of water and soil nutrients, and how green leaves are associated with making food from sunlight (photosynthesis);~~

~~**(iv)** describe the components of and relationships among organisms in a food chain (e.g., plants are the primary source of energy for living systems);~~

~~**(v)** describe how all living things are made up of smaller units that are called cells;~~

~~**(2)** grades K-4 benchmark 2: know that living things have similarities and differences, and that living things change over time;~~

~~**(a)** grade K performance standards:~~

~~**(i)** observe and describe similarities and differences in the appearance and behaviors of living organisms (e.g., plants, animals);~~

~~**(ii)** observe that living organisms (e.g., plants, animals) closely resemble their parents;~~

~~**(b)** grade 1 performance standards:~~

~~**(i)** identify differences between living and non-living things;~~

~~**(ii)** recognize the differences between mature and immature plants and animals (e.g., trees/seedlings, dogs/puppies, cats/kittens);~~

~~**(c)** grade 2 performance standards:~~

~~**(i)** explain that stages of the life cycle are different for different animals (e.g., mouse, cat, horse, butterfly, frog);~~

~~**(ii)** observe that many characteristics of the offspring of living organisms (e.g., plants, animals) are inherited from their parents;~~

~~**(iii)** observe how the environment influences some characteristics of living things (e.g., amount of sunlight required for plant growth);~~

~~**(d)** grade 3 performance standards:~~

~~**(i)** identify how living things cause changes to the environments in which they live, and that some of these changes are detrimental to the organism and some are beneficial;~~

~~**(ii)** know that some kinds of organisms that once lived on earth have become extinct (e.g., dinosaurs) and that others resemble those that are alive today (e.g., alligators, sharks);~~

~~**(e)** grade 4 performance standards:~~

~~**(i)** know that, in any particular environment, some kinds of plants and animals survive well, some survive less well and others cannot survive at all;~~

~~**(ii)** know that a change in physical structure or behavior can improve an organism's chance of survival (e.g., a chameleon changes color, a turtle pulls its head into its shell, a plant bends toward the light);~~

~~**(iii)** describe how some living organisms have developed characteristics from generation to generation to improve chances of survival (e.g., spines on cacti, long beaks on hummingbirds, good eyesight on hawks);~~

~~**(3)** grades K-4 benchmark 3: know the parts of the human body and their functions;~~

~~**(a)** grade K performance standards:~~

~~**(i)** use the senses (e.g., sight, hearing, smell, taste, touch) to observe surroundings and describe the observations;~~

~~**(ii)** identify the parts of the human body (e.g., legs, arms, head, hands) and the functions of these parts;~~

~~**(b)** grade 1 performance standards:~~

~~**(i)** describe simple body functions (e.g., breathing, eating);~~

~~**(ii)** describe the basic food requirements for humans;~~

~~**(iii)** describe how some parts of human bodies differ from similar parts of other animals (e.g., hands and feet or paws, ears);~~

~~**(c)** grade 2 performance standards:~~

~~**(i)** identify a variety of human organs (e.g., lungs, heart, stomach, brain);~~

~~**(ii)** know that various nutrients are required for specific parts and functions of the body (e.g., milk for bones and teeth, protein for muscles, sugar for energy);~~

~~**(iii)** identify the functions of human systems (e.g., respiratory, circulatory, digestive);~~

~~**(d)** grade 3 performance standards:~~

~~**(i)** know that bacteria and viruses are germs that affect the human body;~~

~~**(ii)** describe the nutrients needed by the human body;~~

~~**(e)** grade 4 performance standards:~~

~~**(i)** know that the human body has many parts that interact to function as systems (e.g., skeletal, muscular) and describe the parts and their specific functions in selected systems (e.g., the nose, lungs and diaphragm in the respiratory system);~~

~~**(ii)** recognize that the human body is organized from cells, to tissues, to organs, to systems, to the organism.~~

~~**D.** Strand 2: Content of science. Content standard 3. Earth and space science: Students will understand the structure of earth, the solar system and the universe, the interconnections among them and the processes and interactions of earth's systems. Students will:~~

~~**(1)** grades K-4 benchmark 1: know the structure of the solar system and the objects in the universe;~~

~~**(a)** grade K performance standards:~~

~~**(i)** observe that there are many objects in the night sky and that some are brighter than others;~~

~~**(ii)** describe the location and movements of objects in the sky (e.g., stars, sun, moon);~~

~~**(b)** grade 1 performance standards:~~

~~**(i)** observe the changes that occur in the sky as day changes into night and night into day;~~

~~**(ii)** describe the basic patterns of objects as they move through the sky (e.g., sun appears in the day, moon appears at night but can sometimes be seen during the day, sun and moon appear to move across the sky, moon appears to change shape over the course of a month);~~

~~**(iii)** recognize that the sun, moon and stars all appear to move slowly across the sky;~~

~~**(c)** grade 2 performance standards:~~

~~**(i)** observe that the phase of the moon appears a little different every day, but looks the same again after about four weeks;~~

~~**(ii)** observe that some objects in the night sky are brighter than others;~~

~~**(iii)** know that the sun is a star;~~

~~**(d)** grade 3 performance standards:~~

~~**(i)** describe the objects in the solar system (e.g., sun, earth and other planets, moon) and their features (e.g., size, temperature);~~

~~**(ii)** describe the relationships among the objects in the solar system (e.g., relative distances, orbital motions);~~

~~**(iii)** know that the pattern of stars stays the same as they appear to move across the sky nightly;~~

~~**(iv)** observe that different constellations can be seen in different seasons;~~

~~**(v)** know that telescopes enhance the appearance of some distant objects in the sky (e.g., the moon, planets);~~

~~**(e)** grade 4 performance standards:~~

~~**(i)** understand that the number of stars visible through a telescope is much greater than the number visible to the naked eye;~~

~~**(ii)** know that there are various types of telescopes that use different forms of light to observe distant objects in the sky;~~

~~**(iii)** know that the pattern of stars (e.g., constellations) stays the same although they appear to move across the sky nightly, due to earth's rotation;~~

~~**(2)** grades K-4 benchmark 2: know the structure and formation of earth and its atmosphere and the processes that shape them;~~

~~**(a)** grade K performance standards:~~

~~**(i)** observe that changes in weather occur from day to day and season to season;~~

~~**(ii)** observe that the sun warms the land and water and they warm the air;~~

~~**(b)** grade 1 performance standards:~~

~~**(i)** know that simple tools can be used to measure weather conditions (e.g., thermometer, wind sock, hand-held anemometer, rain gauge) and describe how measurements can be recorded from day to day and across seasons;~~

~~**(ii)** know that there are different climates (e.g., desert, arctic, rain forest);~~

~~**(c)** grade 2 performance standards:~~

~~**(i)** know that rocks have different shapes and sizes (e.g., boulders, pebbles, sand) and that smaller rocks result from the breaking and weathering of larger rocks;~~

~~**(ii)** understand that rocks are made of materials with distinct properties;~~

~~**(iii)** know that soil is made up of weathered rock and organic materials, and how soils differ in their capacity to support the growth of plants;~~

~~**(iv)** recognize the characteristics of the seasons;~~

~~**(d)** grade 3 performance standards:~~

~~**(i)** know that earth's features are constantly changed by a combination of slow and rapid processes that include the action of volcanoes, earthquakes, mountain building, biological changes, erosion and weathering;~~

~~**(ii)** know that fossils are evidence of earlier life and provide data about plants and animals that lived long ago;~~

~~**(iii)** know that air takes up space, is colorless, tasteless and odorless, and exerts a force;~~

~~**(iv)** identify how water exists in the air in different forms (e.g., in clouds and fog as tiny droplets, in rain, snow and hail) and changes from one form to another through various processes (e.g., freezing, condensation, precipitation, evaporation);~~

~~**(e)** grade 4 performance standards:~~

~~**(i)** know that the properties of rocks and minerals reflect the processes that shaped them (e.g., igneous, metamorphic and sedimentary rocks);~~

~~**(ii)** describe how weather patterns generally move from west to east in the United States;~~

~~**(iii)** know that local weather information describes patterns of change over a period of time (e.g., temperature, precipitation symbols, cloud conditions, wind speed/direction).~~

~~**E.** Strand 3: Science and society. Content standard 1: Students will understand how scientific discoveries, inventions, practices and knowledge influence and are influenced by individuals and societies. Students will:~~

~~**(1)** grades K-4 benchmark 1: describe how science influences decisions made by individuals and societies;~~

~~**(a)** grade K performance standards:~~

~~**(i)** recognize that germs exist and may cause disease;~~

~~**(ii)** describe how scientists help to provide products we use every day (e.g., gasoline for cars; electricity for lights, refrigerators, televisions; gas or electricity for heating and cooking);~~

~~**(b)** grade 1 performance standards:~~

~~**(i)** know that germs can be transmitted by touching, breathing and coughing, and that washing hands helps prevent the spread of germs;~~

~~**(ii)** describe how science has assisted in creating tools (e.g., plows, knives, telephones, cell phones, computers) to make life easier and more efficient;~~

~~**(iii)** describe how tools and machines can be helpful, harmful or both (e.g., bicycles, cars, scissors, stoves);~~

~~**(iv)** know that men and women of all ethnic and social backgrounds practice science and technology;~~

~~**(c)** grade 2 performance standards:~~

~~**(i)** describe ways to prevent the spread of germs (e.g., soap, bleach, cooking);~~

~~**(ii)** know that science has ways to help living things avoid sickness or recover from sickness (e.g., vaccinations, medicine) and explain why adult supervision is needed to administer them;~~

~~**(iii)** know that some materials are better than others for making particular things (e.g., paper, cardboard, plastic, metal, fiberglass, wood);~~

~~**(iv)** understand that everybody can do science, invent things and formulate ideas;~~

~~**(v)** know that science has discovered many things about objects, events and nature, and that there are many more questions to be answered;~~

~~**(d)** grade 3 performance standards:~~

~~**(i)** describe how food packaging (e.g., airtight containers, date) and preparation (heating, cooling, salting, smoking, drying) extend food life and the safety of foods (e.g., elimination of bacteria);~~

~~**(ii)** know that science produces information for the manufacture and recycling of materials (e.g., materials that can be recycled - aluminum, paper, plastic - and others that cannot be recycled - gasoline);~~

~~**(iii)** know that naturally-occurring materials (e.g., wood, clay, cotton, animal skins) may be processed or combined with other materials to change their properties;~~

~~**(iv)** know that using poisons can reduce the damage to crops caused by rodents, weeds and insects, but their use may also harm other plants, animals or the environment;~~

~~**(c)** grade 4 performance standards:~~

~~**(i)** know that science has identified substances called pollutants that get into the environment and can be harmful to living things;~~

~~**(ii)** know that, through science and technology, a wide variety of materials not appearing in nature have become available (e.g., steel, plastic, nylon, fiber optics);~~

~~**(iii)** know that science has created ways to store and retrieve information (e.g., paper and ink, printing press, computers, CD-ROMs) but that these are not perfect (e.g., faulty programming, defective hardware);~~

~~**(iv)** know that both men and women of all races and social backgrounds choose science as a career.~~]

[6.29.10.8 NMAC - Rp, 6.29.10.8 NMAC, 6-30-2009]

~~[6.29.10.9 CONTENT STANDARDS WITH BENCHMARKS AND PERFORMANCE STANDARDS FOR SCIENCE, Grades 5-8:~~

~~**A.** Strand 1: Scientific thinking and practice. Content standard 1: Students will understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting and validating in order to think critically. Students will:~~

~~**(1)** grades 5-8 benchmark 1: use scientific methods to develop questions, design and conduct experiments using appropriate technologies, analyze and evaluate results, make predictions and communicate findings;~~

~~**(a)** grade 5 performance standards:~~

~~**(i)** plan and conduct investigations, including: formulating testable questions, making systematic observations, developing logical conclusions and communicating findings;~~

~~**(ii)** use appropriate technologies (e.g., calculators, computers, balances, spring scales, microscopes, etc.) to perform scientific tests and to collect and display data;~~

~~**(iii)** use graphic representations (e.g., charts, graphs, tables, labeled diagrams) to present data and produce explanations for investigations;~~

~~**(iv)** describe how credible scientific investigations use reproducible elements including single variables, controls and appropriate sample sizes to produce valid scientific results;~~

~~**(v)** communicate the steps and results of a scientific investigation;~~

~~**(b)** grade 6 performance standards:~~

~~**(i)** construct appropriate graphs from data and develop qualitative and quantitative statements about the relationships between variables being investigated;~~

~~**(ii)** examine the reasonableness of data supporting a proposed scientific explanation;~~

~~**(iii)** justify predictions and conclusions based on data;~~

~~**(c)** grade 7 performance standards:~~

~~**(i)** use a variety of print and web resources to collect information, inform investigations and answer a scientific question or hypothesis;~~

~~**(ii)** use models to explain the relationships between variables being investigated.~~

~~**(d)** grade 8 performance standards:~~

~~**(i)** evaluate the accuracy and reproducibility of data and observations;~~

~~**(ii)** use a variety of technologies to gather, analyze and interpret scientific data;~~

~~**(iii)** know how to recognize and explain anomalous data;~~

~~**(2)** grades 5-8 benchmark 2: understand the processes of scientific investigation and how scientific inquiry results in scientific knowledge;~~

~~**(a)** grade 5 performance standards:~~

~~**(i)** understand that different kinds of investigations are used to answer different kinds of questions (e.g., observations, data collection, controlled experiments);~~

~~**(ii)** understand that scientific conclusions are subject to peer and public review;~~

~~**(b)** grade 6 performance standards:~~

~~**(i)** understand that scientific knowledge is continually reviewed, critiqued and revised as new data become available;~~

~~**(ii)** understand that scientific investigations use common processes that include the collection of relevant data and observations, accurate measurements, the identification and control of variables and logical reasoning to formulate hypotheses and explanations;~~

~~**(iii)** understand that not all investigations result in defensible scientific explanations;~~

~~**(c)** grade 7 performance standards:~~

~~**(i)** describe how bias can affect scientific investigation and conclusions;~~

~~**(ii)** critique procedures used to investigate an hypothesis;~~

~~**(iii)** analyze and evaluate scientific explanations;~~

~~**(d)** grade 8 performance standards:~~

~~**(i)** examine alternative explanations for observations;~~

~~**(ii)** describe ways in which science differs from other ways of knowing and from other bodies of knowledge (e.g., experimentation, logical arguments, skepticism);~~

~~**(iii)** know that scientific knowledge is built on questions posed as testable hypotheses, which are tested until the results are accepted by peers;~~

~~**(3)** grades 5-8 benchmark 3: use mathematical ideas, tools and techniques to understand scientific knowledge;~~

~~**(a)** grade 5 performance standards:~~

~~**(i)** use appropriate units to make precise and varied measurements;~~

~~**(ii)** use mathematical skills to analyze data;~~

~~**(iii)** make predictions based on analyses of data, observations and explanations;~~

~~**(iv)** understand the attributes to be measured in a scientific investigation and describe the units, systems and processes for making the measurement;~~

~~**(b)** grade 6 performance standards:~~

~~**(i)** evaluate the usefulness and relevance of data to an investigation;~~

~~**(ii)** use probabilities, patterns and relationships to explain data and observations;~~

~~**(c)** grade 7 performance standards:~~

~~**(i)** understand that the number of data (sample size) influences the reliability of a prediction;~~

~~**(ii)** use mathematical expressions to represent data and observations collected in scientific investigations;~~

~~**(iii)** select and use an appropriate model to examine a phenomenon;~~

~~**(d)** grade 8 performance standards:~~

~~**(i)** use mathematical expressions and techniques to explain data and observations and to communicate findings (e.g., formulas and equations, significant figures, graphing, sampling, estimation, mean);~~

~~**(ii)** create models to describe phenomena.~~

~~**B.** Strand 2: Content of science. Content standard 1. Physical science: Students will understand the structure and properties of matter, the characteristics of energy and the interactions between matter and energy. Students will:~~

~~**(1)** grades 5-8 benchmark 1: know the forms and properties of matter and how matter interacts;~~

~~**(a)** grade 5 performance standards:~~

~~**(i)** describe properties (e.g., relative volume, ability to flow) of the three states of matter;~~

~~**(ii)** describe how matter changes from one phase to another (e.g., condensation, evaporation);~~

~~**(iii)** know that matter is made up of particles (atoms) that can combine to form molecules and that these particles are too small to see with the naked eye;~~

~~**(iv)** know that the periodic table is a chart of the pure elements that make up all matter;~~

~~**(v)** describe the relative location and motion of the particles (atoms and molecules) in each state of matter;~~

~~**(vi)** explain the relationship between temperature and the motion of particles in each state of matter;~~

~~**(b)** grade 6 performance standards:~~

~~**(i)** understand that substances have characteristic properties and identify the properties of various substances (e.g., density, boiling point, solubility, chemical reactivity);~~

~~**(ii)** use properties to identify substances (e.g., for minerals: hardness, streak, color, reactivity to acid, cleavage, fracture);~~

~~**(iii)** know that there are about 100 known elements that combine to produce compounds in living organisms and non-living substances;~~

~~**(iv)** know the differences between chemical and physical properties and how these properties can influence the interactions of matter;~~

~~**(c)** grade 7 performance standards:~~

~~**(i)** explain how matter is transferred from one organism to another and between organisms and their environment (e.g., consumption, the water cycle, the carbon cycle, the nitrogen cycle);~~

~~**(ii)** know that the total amount of matter (mass) remains constant although its form, location and properties may change (e.g., matter in the food web);~~

~~**(iii)** identify characteristics of radioactivity, including: decay in time of some elements to others, release of energy, damage to cells;~~

~~**(iv)** describe how substances react chemically in characteristic ways to form new substances (compounds) with different properties (e.g., carbon and oxygen combine to form carbon dioxide in respiration);~~

~~**(v)** know that chemical reactions are essential to life processes;~~

~~**(d)** grade 8 performance standards on properties of matter:~~

~~**(i)** know how to use density, boiling point, freezing point, conductivity and color to identify various substances;~~

~~**(ii)** distinguish between metals and non-metals;~~

~~**(iii)** understand the differences among elements, compounds and mixtures by:~~
~~classification of materials as elements, compounds or mixtures, interpretation of chemical formulas, separation of mixtures into compounds by methods including evaporation, filtration, screening and magnetism;~~

~~**(e)** grade 8 performance standards on structures of matter:~~

~~**(i)** identify the protons, neutrons and electrons within an atom and describe their locations (i.e., in the nucleus or in motion outside the nucleus);~~

~~**(ii)** explain that elements are organized in the periodic table according to their properties;~~

~~**(iii)** know that compounds are made of two or more elements, but not all sets of elements can combine to form compounds;~~

~~**(f)** grade 8 performance standards on changes in matter:~~

~~**(i)** know that phase changes are physical changes that can be reversed (e.g., evaporation, condensation, melting);~~

~~**(ii)** describe various familiar physical and chemical changes that occur naturally (e.g., snow melting, photosynthesis, rusting, burning);~~

~~**(iii)** identify factors that influence the rate at which chemical reactions occur (e.g., temperature, concentration);~~

~~**(iv)** know that chemical reactions can absorb energy (endothermic reactions) or release energy (exothermic reactions);~~

~~**(2)** grades 5-8 benchmark 2: explain the physical processes involved in the transfer, change and conservation of energy;~~

~~**(a)** grade 5 performance standards:~~

~~**(i)** know that heat is transferred from hotter to cooler materials or regions until both reach the same temperature;~~

~~**(ii)** know that heat is often produced as a by-product when one form of energy is converted to another form (e.g., when machines or organisms convert stored energy into motion);~~

~~**(iii)** know that there are different forms of energy;~~

(iv) describe how energy can be stored and converted to a different form of energy (e.g., springs, gravity) and know that machines and living things convert stored energy to motion and heat;

(b) grade 6 performance standards:

(i) identify various types of energy (e.g., heat, light, mechanical, electrical, chemical, nuclear);

(ii) understand that heat energy can be transferred through conduction, radiation and convection;

(iii) know that there are many forms of energy transfer, but the total amount of energy is conserved (i.e., that energy is neither created nor destroyed);

(iv) understand that some energy travels as waves (e.g., seismic, light, sound) including: the sun as source of energy for many processes on earth, different wavelengths of sunlight (e.g., visible, ultraviolet, infrared), vibrations of matter (e.g., sound, earthquakes), different speeds through different materials;

(c) grade 7 performance standards: know how various forms of energy are transformed through organisms and ecosystems, including: sunlight and photosynthesis, energy transformation in living systems (e.g., cellular processes changing chemical energy to heat and motion), effect of mankind's use of energy and other activities on living systems (e.g., global warming, water quality);

(d) grade 8 performance standards on energy transformation:

(i) know that energy exists in many forms and that, when energy is transformed, some energy is usually converted to heat;

(ii) know that kinetic energy is a measure of the energy of an object in motion and potential energy is a measure of an object's position or composition, including transformation of gravitational potential energy of position into kinetic energy of motion by a falling object;

(iii) distinguish between renewable and non-renewable sources of energy;

(iv) know that electrical energy is the flow of electrons through electrical conductors that connect sources of electrical energy to points of use, including: electrical current paths through parallel and series circuits, production of electricity by fossil-fueled and nuclear power plants, wind generators, geothermal plants and solar cells, use of electricity by appliances and equipment (e.g., calculators, hair dryers, light bulbs, motors);

(e) grade 8 performance standards on waves:

(i) understand how light and radio waves carry energy through vacuum or matter by: straight-line travel unless an object is encountered, reflection by a mirror, refraction by a lens, absorption by a dark object, separation of white light into different wave lengths by prisms, visibility of objects due to light emission or scattering;

(ii) understand that vibrations of matter (e.g., sound, earthquakes, water waves) carry wave energy, including: sound transmission through solids, liquids and gases; relationship of pitch and loudness of sound to rate and distance (amplitude) of vibration; ripples made by objects dropped in water;

(3) grades 5-8 benchmark 3: describe and explain forces that produce motion in objects;

(a) grade 5 performance standards:

(i) understand how the rate of change of position is the velocity of an object in motion;

(ii) recognize that acceleration is the change in velocity with time;

(iii) identify forces in nature (e.g., gravity, magnetism, electricity, friction);

(iv) understand that, when a force (e.g., gravity, friction) acts on an object, the object speeds up, slows down or goes in a different direction;

(v) identify simple machines and describe how they give advantage to users (e.g., levers, pulleys, wheels and axles, inclined planes, screws, wedges);

(b) grade 6 performance standards:

(i) know that every object exerts gravitational force on every other object, dependent on the masses and distance of separation (e.g., motions of celestial objects, tides);

(ii) know that gravitational force is hard to detect unless one of the objects (e.g., earth) has a lot of mass;

(c) grade 7 performance standards: know that forces cause motion in living systems, including the principle of a lever and how it gives mechanical advantage to a muscular/skeletal system to lift objects, and forces in specific systems in the human body (e.g., how the heart generates blood pressure, how muscles contract and expand to produce motion);

(d) grade 8 performance standards on forces:

(i) know that there are fundamental forces in nature (e.g., gravity, electromagnetic forces, nuclear forces);

(ii) know that a force has both magnitude and direction;

(iii) analyze the separate forces acting on an object at rest or in motion (e.g., gravity, elastic forces, friction), including how multiple forces reinforce or cancel one another to result in a net force that acts on an object;

(iv) know that electric charge produces electrical fields and magnets produce magnetic fields;

(v) know how a moving magnetic field can produce an electric current (generator) and how an electric current can produce a magnetic field (electromagnet);

(vi) know that earth has a magnetic field;

(e) grade 8 performance standards on motion:

(i) know that an object's motion is always described relative to some other object or point (i.e., frame of reference);

(ii) understand and apply Newton's laws of motion: objects in motion will continue in motion, and objects at rest will remain at rest, unless acted upon by an unbalanced force (inertia). If a greater force is applied to an object, a proportionally greater acceleration will occur; if an object has more mass, the effect of an applied force is proportionally less.

C. Strand 2: Content of science. Content standard 2. Life science: Students will understand the properties, structures and processes of living things and the interdependence of living things and their environments. Students will:

(1) grades 5-8 benchmark 1: explain the diverse structures and functions of living things and the complex relationships between living things and their environments;

(a) grade 5 performance standards:

(i) identify the components of habitats and ecosystems (producers, consumers, decomposers, predators);

(ii) understand how food webs depict relationships between different organisms;

(iii) know that changes in the environment can have different effects on different organisms (e.g., some organisms move, some survive, some reproduce, some die);

(iv) describe how human activity impacts the environment;

(b) grade 6 performance standards:

(i) understand how organisms interact with their physical environments to meet their needs (i.e., food, water, air) and how the water cycle is essential to most living systems;

(ii) describe how weather and geologic events (e.g., volcanoes, earthquakes) affect the function of living systems;

(iii) describe how organisms have adapted to various environmental conditions;

(c) grade 7 performance standards on populations and ecosystems:

(i) identify the living and non-living parts of an ecosystem and describe the relationships among these components;

(ii) explain biomes (i.e., aquatic, desert, rainforest, grasslands, tundra) and describe the New Mexico biome;

(iii) explain how individuals of species that exist together interact with their environment to create an ecosystem (e.g., populations, communities, niches, habitats, food webs);

(iv) explain the conditions and resources needed to sustain life in specific ecosystems;

(v) describe how the availability of resources and physical factors limit growth (e.g., quantity of light and water, range of temperature, composition of soil) and how the water, carbon and nitrogen cycles contribute to the availability of those resources to support living systems;

(d) grade 7 performance standards on biodiversity:

(i) understand how diverse species fill all niches in an ecosystem;

(ii) know how to classify organisms into domain, kingdom, phylum, class, order, family, genus, species;

(e) grade 8 performance standards:

~~**(i)** describe how matter moves through ecosystems (e.g., water cycle, carbon cycle);~~

~~**(ii)** describe how energy flows through ecosystems (e.g., sunlight, green plants, food for animals);~~

~~**(iii)** explain how a change in the flow of energy can impact an ecosystem (e.g., the amount of sunlight available for plant growth, global climate change);~~

~~**(2)** grades 5-8 benchmark 2: understand how traits are passed from one generation to the next and how species evolve;~~

~~**(a)** grade 5 performance standards:~~

~~**(i)** know that plants and animals have life cycles that include birth, growth and development, reproduction and death, and that these cycles differ for different organisms;~~

~~**(ii)** identify characteristics of an organism that are inherited from its parents (e.g., eye color in humans, flower color in plants) and other characteristics that are learned or result from interactions with the environment;~~

~~**(iii)** understand that heredity is the process by which traits are passed from one generation to another;~~

~~**(b)** grade 6 performance standards:~~

~~**(i)** understand that the fossil record provides data for how living organisms have evolved;~~

~~**(ii)** describe how species have responded to changing environmental conditions over time (e.g., extinction, adaptation);~~

~~**(c)** grade 7 performance standards on reproduction:~~

~~**(i)** know that reproduction is a characteristic of all living things and is essential to the continuation of a species;~~

~~**(ii)** identify the differences between sexual and asexual reproduction;~~

~~**(iii)** know that, in sexual reproduction, an egg and sperm unite to begin the development of a new individual;~~

~~**(iv)** know that organisms that sexually reproduce fertile offspring are members of the same species;~~

~~**(d)** grade 7 performance standards on heredity:~~

~~**(i)** understand that some characteristics are passed from parent to offspring as inherited traits and others are acquired from interactions with the environment;~~

~~**(ii)** know that hereditary information is contained in genes that are located in chromosomes, including: determination of traits by genes, traits determined by one or many genes, more than one trait sometimes influenced by a single gene;~~

~~**(e)** grade 7 performance standards on biological evolution:~~

~~**(i)** describe how typical traits may change from generation to generation due to environmental influences (e.g., color of skin, shape of eyes, camouflage, shape of beak);~~

~~**(ii)** explain that diversity within a species is developed by gradual changes over many generations;~~

~~**(iii)** know that organisms can acquire unique characteristics through naturally occurring genetic variations;~~

~~**(iv)** identify adaptations that favor the survival of organisms in their environments (e.g., camouflage, shape of beak);~~

~~**(v)** understand the process of natural selection;~~

~~**(vi)** explain how species adapt to changes in the environment or become extinct, and that extinction of species is common in the history of living things;~~

~~**(vii)** know that the fossil record documents the appearance, diversification and extinction of many life forms;~~

~~**(f)** grade 8 performance standards:~~

~~**(i)** understand that living organisms are made mostly of molecules consisting of a limited number of elements (e.g., carbon, hydrogen, nitrogen, oxygen);~~

~~**(ii)** identify DNA as the chemical compound involved in heredity in living organisms;~~

~~**(iii)** describe the widespread role of carbon in the chemistry of living systems;~~

~~**(3)** grades 5-8 benchmark 3: understand the structure of organisms and the function of cells in living systems;~~

~~**(a)** grade 5 performance standards:~~

~~**(i)** understand that all living organisms are composed of cells from one to many trillions, and that cells are usually only visible through a microscope;~~

~~**(ii)** know that some organisms are made of a collection of similar cells that cooperate (e.g., algae) while other organisms are made of cells that are different in appearance and function (e.g., corn, birds);~~

~~**(iii)** describe the relationships among cells, tissues, organs, organ systems, whole organisms and ecosystems;~~

~~**(b)** grade 6 performance standards:~~

~~**(i)** explain how fossil fuels were formed from animal and plant cells;~~

~~**(ii)** describe the differences between substances that were produced by living organisms (e.g., fossil fuels) and substances that result from non-living processes (e.g., igneous rocks);~~

~~**(c)** grade 7 performance standards on the structure of organisms:~~

~~**(i)** understand that organisms are composed of cells and identify unicellular and multi-cellular organisms;~~

~~**(ii)** explain how organs are composed of tissues of different types of cells (e.g., skin, bone, muscle, heart, intestines);~~

~~**(d)** grade 7 performance standards on the function of cells:~~

~~**(i)** understand that many basic functions of organisms are carried out in cells, including: growth and division to produce more cells (mitosis) and specialized functions of cells (e.g., reproduction, nerve signal transmission, digestion, excretion, movement, transport of oxygen);~~

~~**(ii)** compare the structure and processes of plant cells and animal cells;~~

~~**(iii)** describe how some cells respond to stimuli (e.g., light, heat, pressure, gravity);~~

~~**(iv)** describe how factors (radiation, UV light, drugs) can damage cellular structure or function;~~

~~**(e)** grade 8 performance standards:~~

~~**(i)** describe how cells use chemical energy obtained from food to conduct cellular functions (i.e., respiration);~~

~~**(ii)** explain that photosynthesis in green plants captures the energy from the sun and stores it chemically;~~

~~**(iii)** describe how chemical substances can influence cellular activity (e.g., pH).~~

~~**D.** Strand 2: Content of science. Content standard 3. Earth and space science: Students will understand the structure of earth, the solar system and the universe, the interconnections among them and the processes and interactions of earth's systems. Students will:~~

~~**(1)** grades 5-8 benchmark 1: describe how the concepts of energy, matter and force can be used to explain the observed behavior of the solar system, the universe and their structures;~~

~~**(a)** grade 5 performance standards:~~

~~**(i)** know that many objects in the universe are huge and are separated from one another by vast distances (e.g., many stars are larger than the sun, but so distant that they look like points of light);~~

~~**(ii)** understand that earth is part of a larger solar system, which is part of an even larger galaxy (milky way), which is one of many galaxies;~~

~~**(iii)** know that there have been manned and unmanned journeys to space and to the moon;~~

~~**(b)** grade 6 performance standards on the universe: describe the objects in the universe, including billions of galaxies, each containing billions of stars, and different sizes, temperatures and colors of stars in the milky way galaxy;~~

~~**(c)** Grade 6 performance standards on the solar system:~~

~~**(i)** Locate the solar system in the milky way galaxy;~~

~~**(ii)** identify the components of the solar system and describe their defining characteristics and motions in space, including: sun as a medium-sized star, sun's composition (i.e., hydrogen, helium) and energy production, and nine planets, their moons, asteroids;~~

~~**(iii)** know that the regular and predictable motions of the earth-moon-sun system explain phenomena on earth, including: earth's motion in relation to a year, a day, the seasons, the phases of the moon, eclipses, tides and shadows, and moon's orbit around earth once in 28 days in relation to the phases of the moon;~~

~~**(d)** grade 7 performance standards:~~

~~**(i)** explain why earth is unique in our solar system in its ability to support life;~~

~~**(ii)** explain how energy from the sun supports life on earth;~~

~~**(e)** grade 8 performance standards:~~

~~**(i)** understand how energy from the sun and other stars, in the form of light, travels long distances to reach earth;~~

~~**(ii)** explain how the properties of light (e.g., emission, reflection, refraction) emitted from the sun and stars are used to learn about the universe, including: distances in the solar system and the universe, and temperatures of different stars;~~

~~**(iii)** understand how gravitational force acts on objects in the solar system and the universe, including similar action on masses on earth and on other objects in the solar system; and explain the orbits of the planets around the sun;~~

~~**(2)** grades 5-8 benchmark 2: describe the structure of earth and its atmosphere, and explain how energy, matter and forces shape earth's systems;~~

~~**(a)** grade 5 performance standards:~~

~~**(i)** understand that water and air relate to earth's processes, including: how the water cycle relates to weather, and how clouds are made of tiny droplets of water, like fog or steam;~~

~~**(ii)** know that air is a substance that surrounds earth (atmosphere), takes up space and moves, and that temperature fluctuations and other factors produce wind currents;~~

~~**(iii)** know that most of earth's surface is covered by water, that most of that water is salt water in oceans, and that fresh water is found in rivers, lakes, underground sources and glaciers;~~

~~**(iv)** recognize that the seasons are caused by earth's motion around the sun and the tilt of earth's axis of rotation;~~

~~**(b)** grade 6 performance standards on the structure of earth:~~

~~**(i)** know that earth is composed of layers that include crust, mantle and core;~~

~~**(ii)** know that earth's crust is divided into plates that move very slowly in response to movements in the mantle;~~

~~**(iii)** know that sedimentary, igneous and metamorphic rocks contain evidence of the materials, temperatures and forces that created them;~~

~~**(c)** grade 6 performance standards on weather and climate:~~

~~**(i)** describe the composition (i.e., nitrogen, oxygen, water vapor) and strata of earth's atmosphere and differences between the atmosphere of earth and those of other planets;~~

~~**(ii)** understand factors that create and influence weather and climate, including: heat, air movement, pressure, humidity, oceans, how clouds form by condensation of water vapor, how weather patterns are related to atmospheric pressure, global patterns of atmospheric movement (e.g., El Niño) and factors that can impact earth's climate (e.g., volcanic eruptions, impacts of asteroids, glaciers);~~

~~**(iii)** understand how to use weather maps and data (e.g., barometric pressure, wind speeds, humidity) to predict weather;~~

~~**(d)** grade 6 performance standards on changes to earth:~~

~~**(i)** know that land forms are created and change through a combination of constructive and destructive forces, including: weathering of rock and soil, transportation, deposition of sediment and tectonic activity; similarities and differences between current and past processes on earth's surface (e.g., erosion, plate tectonics, changes in atmospheric composition) and impact of volcanoes and faults on New Mexico geology;~~

~~**(ii)** understand the history of earth and how information about it comes from layers of sedimentary rock, including: sediments and fossils as a record of a very slowly changing world and evidence of asteroid impact, volcanic and glacial activity;~~

~~**(e)** grade 7 performance standards:~~

~~**(i)** understand how the remains of living things give us information about the history of earth, including: layers of sedimentary rock, the fossil record and radioactive dating, showing that life has been present on earth for more than 3.5 billion years;~~

~~**(ii)** understand how living organisms have played many roles in changes of earth's systems through time (e.g., atmospheric composition, creation of soil, impact on earth's surface);~~

~~**(iii)** know that changes to ecosystems sometimes decrease the capacity of the environment to support some life forms and are difficult and costly to remediate;~~

~~**(f)** grade 8 performance standards:~~

~~**(i)** describe the role of pressure and heat in the rock cycle;~~

~~**(ii)** understand the unique role that water plays on earth, including its ability to remain liquid at most earth temperatures, properties of water related to processes in the water cycle (evaporation, condensation, precipitation, surface run-off, percolation, dissolving of minerals and gases and transport to the oceans, fresh and salt water in oceans, rivers, lakes and glaciers, and reactant in photosynthesis);~~

~~**(iii)** understand the geologic conditions that have resulted in energy resources (e.g., oil, coal, natural gas) available in New Mexico.~~

~~**E.** Strand 3: Science and society. Content standard 1: Understand how scientific discoveries, inventions, practices and knowledge influence, and are influenced by, individuals and societies. Students will: grades 5-8 benchmark 1: explain how scientific discoveries and inventions have changed individuals and societies;~~

~~**(1)** grade 5 performance standards:~~

~~**(a)** describe the contributions of science to understanding local or current issues (e.g., watershed and community decisions regarding water use);~~

~~**(b)** describe how various technologies have affected the lives of individuals (e.g., transportation, entertainment, health);~~

~~**(2)** grade 6 performance standards:~~

~~**(a)** examine the role of scientific knowledge in decisions (e.g., space exploration, what to eat, preventive medicine and medical treatment);~~

~~**(b)** describe the technologies responsible for revolutionizing information processing and communications (e.g., computers, cellular phones, internet);~~

~~**(3)** grade 7 performance standards:~~

~~**(a)** analyze the contributions of science to health as they relate to personal decisions about smoking, drugs, alcohol and sexual activity;~~

~~**(b)** analyze how technologies have been responsible for advances in medicine (e.g., vaccines, antibiotics, microscopes, DNA technologies);~~

~~**(c)** describe how scientific information can help individuals and communities respond to health emergencies (e.g., CPR, epidemics, HIV, bio-terrorism);~~

~~**(4)** grade 8 performance standards:~~

~~**(a)** analyze the interrelationship between science and technology (e.g., germ theory, vaccines);~~

~~**(b)** describe how scientific information can help to explain environmental phenomena (e.g., floods, earthquakes, volcanoes, fire, extreme weather);~~

~~**(c)** describe how technological revolutions have significantly influenced societies (e.g., energy production, warfare, space exploration);~~

~~**(d)** critically analyze risks and benefits associated with technologies related to energy production.~~]

[6.29.10.9 NMAC - Rp, 6.29.10.9 NMAC, 6-30-2009]

~~[6.29.10.10 CONTENT STANDARDS WITH BENCHMARKS AND PERFORMANCE STANDARDS FOR SCIENCE, Grades 9-12:~~

~~**A.** Strand 1: Scientific thinking and practice. Content standard 1: Students will understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting and validating in order to think critically. Students will:~~

~~**(1)** grades 9-12 benchmark 1: use accepted scientific methods to collect, analyze and interpret data and observations, to design and conduct scientific investigations and communicate results; grades 9-12 performance standards:~~

~~**(a)** describe the essential components of an investigation, including appropriate methodologies, proper equipment and safety precautions;~~

(b) design and conduct scientific investigations that include: 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;

(c) use appropriate technologies to collect, analyze and communicate scientific data (e.g., computers, calculators, balances, microscopes);

(d) convey results of investigations using scientific concepts, methodologies and expressions, including: 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;

(e) understand how scientific theories are used to explain and predict natural phenomena (e.g., plate tectonics, ocean currents, structure of atom);

(2) grades 9-12 benchmark 2: understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised or rejected; grade 9-12 performance standards:

(a) understand how scientific processes produce valid, reliable results, including: consistency of explanations with data and observations, openness to peer review, full disclosure and examination of assumptions, testability of hypotheses, repeatability of experiments and reproducibility of results;

(b) use scientific reasoning and valid logic to identify: faulty logic, cause and effect, the difference between observation and unsubstantiated inferences, conclusions and potential bias;

(c) understand how new data and observations can result in new scientific knowledge;

(d) critically analyze an accepted explanation by reviewing current scientific knowledge;

(e) examine investigations of current interest in science (e.g., superconductivity, molecular machines, age of the universe);

(f) examine the scientific processes and logic used in: investigations of past events (e.g., using data from crime scenes, fossils), investigations that can be planned in advance but are only done once (e.g., expensive or time-consuming experiments, such as medical clinical trials), and investigations of phenomena that can be repeated easily and frequently;

(3) grades 9-12 benchmark 3: use mathematical concepts, principles and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings and draw conclusions; grades 9-12 performance standards:

(a) create multiple displays of data to analyze and explain the relationships in scientific investigations;

(b) use mathematical models to describe, explain and predict natural phenomena;

(c) use technologies to quantify relationships in scientific hypotheses (e.g., calculators, computer spreadsheets and databases, graphing software, simulations, modeling);

(d) identify and apply measurement techniques and consider possible effects of measurement errors;

(e) use mathematics to express and establish scientific relationships (e.g., scientific notation, vectors, dimensional analysis).

B. Strand 2: Content of science. Content standard 1. Physical science: Understand the structure and properties of matter, the characteristics of energy and the interactions between matter and energy. Students will:

(1) grades 9-12 benchmark 1: understand the properties underlying structure and reactions of matter;

(a) grades 9-12 performance standards on properties of matter:

(i) classify matter in a variety of ways (e.g., element, compound, mixture; solid, liquid, gas; acidic, basic, neutral);

(ii) identify, measure and use a variety of physical and chemical properties (e.g., electrical conductivity, density, viscosity, chemical reactivity, pH, melting point);

(iii) know how to use properties to separate mixtures into pure substances (e.g., distillation, chromatography, solubility);

(iv) describe trends in properties (e.g., ionization energy or reactivity as a function of location on the periodic table and the boiling points of organic liquids as a function of molecular weight);

(b) grades 9-12 performance standards on structure of matter:

~~**(i)** understand that matter is made of atoms and that atoms are made of subatomic particles;~~

~~**(ii)** understand atomic structure, including: most space occupied by electrons, nucleus made of protons and neutrons, isotopes of an element, mass of proton and neutrons 2000 times greater than mass of electron, and atoms held together by proton-electron electrical forces;~~

~~**(iii)** explain how electrons determine the properties of substances by: interactions between atoms through transferring or sharing valence electrons, ionic and covalent bonds, and the ability of carbon to form a diverse array of organic structures;~~

~~**(iv)** make predictions about elements using the periodic table (e.g., number of valence electrons, metallic character, reactivity, conductivity, type of bond between elements);~~

~~**(v)** understand how the type and arrangement of atoms and their bonds determine macroscopic properties (e.g., boiling point, electrical conductivity, hardness of minerals);~~

~~**(vi)** know that states of matter (i.e., solid, liquid, gas) depend on the arrangement of atoms and molecules and on their freedom of motion;~~

~~**(vii)** know that some atomic nuclei can change, including: spontaneous decay, half-life of isotopes, fission, fusion (e.g., the sun), alpha, beta and gamma radiation;~~

~~**(c)** grades 9-12 performance standards on chemical reactions:~~

~~**(i)** know that chemical reactions involve the rearrangement of atoms and that they occur on many time scales (e.g., picoseconds to millennia);~~

~~**(ii)** understand types of chemical reactions (e.g., synthesis, decomposition, combustion, redox, neutralization) and identify them as exothermic or endothermic;~~

~~**(iii)** know how to express chemical reactions with balanced equations that show conservation of mass and products of common reactions;~~

~~**(iv)** describe how the rate of chemical reactions depends on many factors that include temperature, concentration and the presence of catalysts;~~

~~**(2)** grades 9-12 benchmark 2: understand the transformation and transmission of energy and how energy and matter interact;~~

~~**(a)** grades 9-12 performance standards on energy transformation and transfer:~~

~~**(i)** identify different forms of energy, including kinetic, gravitational (potential), chemical, thermal, nuclear and electromagnetic;~~

~~**(ii)** explain how thermal energy (heat) consists of the random motion and vibrations of atoms and molecules, and is measured by temperature;~~

~~**(iii)** understand that energy can change from one form to another (e.g., changes in kinetic and potential energy in a gravitational field, heats of reaction, hydroelectric dams) and know that energy is conserved in these changes;~~

~~**(iv)** understand how heat can be transferred by conduction, convection and radiation, and how heat conduction differs in conductors and insulators;~~

~~**(v)** explain how heat flows in terms of the transfer of vibrational motion of atoms and molecules from hotter to colder regions;~~

~~**(vi)** understand that the ability of energy to do something useful (work) tends to decrease (and never increases) as energy is converted from one form to another;~~

~~**(b)** grades 9-12 performance standards on interactions of energy and matter:~~

~~**(i)** understand that electromagnetic waves carry energy that can be transferred when they interact with matter;~~

~~**(ii)** describe the characteristics of electromagnetic waves (e.g., visible light, radio, microwave, X-ray, ultraviolet, gamma) and other waves (e.g., sound, seismic waves, water waves), including origin and potential hazards of various forms of electromagnetic radiation, and energy of electromagnetic waves carried in discrete energy packets (photons) whose energy is inversely proportional to wavelength;~~

~~**(iii)** know that each kind of atom or molecule can gain or lose energy only in discrete amounts;~~

~~**(iv)** explain how wavelengths of electromagnetic radiation can be used to identify atoms, molecules and the composition of stars;~~

~~**(v)** understand the concept of equilibrium (i.e., thermal, mechanical and chemical);~~

~~**(3)** grades 9-12 benchmark 3: students will understand the motion of objects and waves and the forces that cause them.~~

(a) grades 9-12 performance standards on forces:

(i) know that there are four fundamental forces in nature: gravitation, electromagnetism, weak nuclear force and strong nuclear force;

(ii) know that every object exerts gravitational force on every other object and describe how this force depends on the masses of the objects and the distance between them;

(iii) know that materials containing equal amounts of positive and negative charges are electrically neutral, but that a small excess or deficit of negative charges produces significant electrical forces;

(iv) understand the relationship between force and pressure and how the pressure of a volume of gas depends on the temperature and the amount of gas;

(v) explain how electric currents cause magnetism and how changing magnetic fields produces electricity (e.g., electric motors, generators);

(vi) represent the magnitude and direction of forces by vector diagrams;

(vii) know that, when one object exerts a force on a second object, the second object exerts a force of equal magnitude and in the opposite direction on the first object (i.e., Newton's third law);

(b) grades 9-12 performance standards on motion:

(i) apply Newton's laws to describe and analyze the behavior of moving objects, including: displacement, velocity and acceleration of a moving object, Newton's second law (F = ma), e.g., momentum and its conservation, the motion of an object falling under gravity, the independence of a falling object's motion on mass); circular motion and centripetal force;

(ii) describe relative motion using frames of reference;

(iii) describe wave propagation using amplitude, wavelength, frequency and speed;

(iv) explain how the interactions of waves can result in interference, reflection and refraction;

(v) describe how waves are used for practical purposes (e.g., seismic data, acoustic effects, Doppler effect).

C. Strand 2: Content of science. Content standard 2. Life science: Students will understand the properties, structures and processes of living things and the interdependence of living things and their environments. Students will:

(1) grades 9-12 benchmark 1: understand how the survival of species depends on biodiversity and on complex interactions, including the cycling of matter and the flow of energy;

(a) grades 9-12 performance standards on ecosystems:

(i) know that an ecosystem is complex and may exhibit fluctuations around a steady state or may evolve over time;

(ii) describe how organisms cooperate and compete in ecosystems (e.g., producers, decomposers, herbivores, carnivores, omnivores, predator-prey, symbiosis, mutualism);

(iii) understand and describe how available resources limit the amount of life an ecosystem can support (e.g., energy, water, oxygen, nutrients);

(iv) critically analyze how humans modify and change ecosystems (e.g., harvesting, pollution, population growth, technology);

(b) grades 9-12 performance standards on energy flow in the environment:

(i) explain how matter and energy flow through biological systems (e.g., organisms, communities, ecosystems) and how the total amount of matter and energy is conserved, but some energy is always released as heat to the environment;

(ii) describe how energy flows from the sun through plants to herbivores to carnivores and decomposers;

(iii) understand and explain the principles of photosynthesis (i.e., chloroplasts in plants convert light energy, carbon dioxide and water into chemical energy);

(c) grades 9-12 performance standards on biodiversity:

(i) understand and explain the hierarchical classification scheme (i.e., domain, kingdom, phylum, class, order, family, genus, species) including: classification of an organism into a category, similarity inferred from molecular structure (DNA) closely matching classification based on anatomical similarities, and similarities of organisms reflecting evolutionary relationships;

(ii) understand variation within and among species, including: mutations and genetic drift, factors affecting the survival of an organism and natural selection;

(2) grades 9-12 benchmark 2: understand the genetic basis for inheritance and the basic concepts of biological evolution;

(a) grades 9-12 performance standards on genetics:

(i) know how DNA carries all genetic information in the units of heredity called genes, including: the structure of DNA (e.g., sub-units A, G, C, T), information-preserving replication of DNA and alteration of genes by inserting, deleting or substituting parts of DNA;

(ii) use appropriate vocabulary to describe inheritable traits (i.e., genotype, phenotype);

(iii) explain the concepts of segregation, independent assortment and dominant/recessive alleles;

(iv) identify traits that can and cannot be inherited;

(v) know how genetic variability results from the recombination and mutation of genes, including: sorting and recombination of genes in sexual reproduction resulting in a change in DNA that is passed on to offspring; radiation or chemical substances that can cause mutations in cells, resulting in a permanent change in DNA;

(vi) understand the principles of sexual and asexual reproduction, including meiosis and mitosis;

(vii) know that most cells in the human body contain 23 pairs of chromosomes, including one pair that determines sex; and that human females have two X chromosomes, while human males have an X and a Y chromosome;

(b) grades 9-12 performance standards on biological evolution:

(i) describe the evidence for the first appearance of life on earth as one-celled organisms over 3.5 billion years ago, and for the later appearance of a diversity of multicellular organisms over millions of years;

(ii) critically analyze the data and observations supporting the conclusion that the species living on earth today are related by descent from the ancestral one-celled organisms;

(iii) understand the data, observations and logic supporting the conclusion that species today evolved from earlier, distinctly different species, originating from the ancestral one-celled organisms;

(iv) understand 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;

(v) explain how natural selection favors individuals who are better able to survive, reproduce and leave offspring;

(vi) analyze how evolution by natural selection and other mechanisms explains many phenomena, including the fossil record of ancient life forms and similarities (both physical and molecular) among different species;

(3) grades 9-12 benchmark 3: students will understand the characteristics, structures and functions of cells;

(a) grade 9-12 performance standards on structure and function:

(i) know that cells are made of proteins composed of combinations of amino acids;

(ii) know that specialized structures inside cells in most organisms carry out different functions, including: 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;

(iii) describe the mechanisms for cellular processes (e.g., energy production and storage, transport of molecules, waste disposal, synthesis of new molecules);

(iv) know how the cell membrane controls which ions and molecules enter and leave the cell, based on membrane permeability and transport (i.e., osmosis, diffusion, active transport and passive transport);

(v) explain how cells differentiate and specialize during the growth of an organism, including: differentiation regulated through the selected expression of different genes and specialized cells, response to stimuli (e.g., nerve cells, sense organs);

(vi) know that DNA directs protein building (e.g., role of RNA);

(b) grades 9-12 performance standards on biochemical mechanisms: describe how most cell functions involve chemical reactions, including promotion or inhibition of biochemical reactions by enzymes, processes of respiration (e.g., energy production, ATP) and communication from cell to cell by secretion of a variety of chemicals (e.g., hormones).

D. Strand 2: Content of science. Content standard 3. Earth and space science: Students will understand the structure of earth, the solar system and the universe, the interconnections among them and the processes and interactions of earth's systems. Students will:

(1) grades 9-12 benchmark 1: examine the scientific theories of the origin, structure, contents and evolution of the solar system and the universe and their interconnections; grades 9-12 performance standards:

(a) understand the scale and contents of the universe, including: range of structures from atoms through astronomical objects to the universe, and objects in the universe, such as: planets, stars, galaxies and nebulae;

(b) predict changes in the positions and appearances of objects in the sky (e.g., moon, sun) based on knowledge of current positions and patterns of movements (e.g., lunar cycles, seasons);

(c) understand how knowledge about the universe comes from evidence collected from advanced technology (e.g., telescopes, satellites, images, computer models);

(d) describe the key observations that led to the acceptance of the big bang theory and that the age of the universe is over 10 billion years;

(e) explain how objects in the universe emit different electromagnetic radiation and how this information is used;

(f) describe how stars are powered by nuclear fusion, how luminosity and temperature indicate their age, and how stellar processes create heavier and stable elements that are found throughout the universe;

(g) examine the role that New Mexico research facilities play in current space exploration (e.g., very large array, Goddard space center);

(2) grades 9-12 benchmark 2: examine the scientific theories of the origin, structure, energy and evolution of earth and its atmosphere and their interconnections;

(a) grade 9-12 performance standards on characteristics and evolution of earth:

(i) describe the characteristics and the evolution of earth in terms of the geosphere, the hydrosphere, the atmosphere and the biosphere;

(ii) recognize that radiometric data indicate that earth is at least 4 billion years old and that earth has changed during that period;

(iii) describe the internal structure of earth (e.g., core, mantle, crust) and the structure of earth's plates;

(iv) understand the changes in earth's past and the investigative methods used to determine geologic time, including: rock sequences, relative dating, fossil correlation and radiometric dating, geologic time scales, historic changes in life forms and the evidence for absolute ages (e.g., radiometric methods, tree rings, paleomagnetism);

(v) explain plate tectonic theory and describe the evidence that supports it;

(b) grade 9-12 performance standards on energy in earth's system:

(i) know that earth's systems are driven by internal (e.g., radioactive decay and gravitational energy) and external (e.g., the sun) sources of energy;

(ii) describe convection as the mechanism for moving heat energy from deep within earth to the surface and discuss how this process results in plate tectonics, including: geological manifestations (e.g., earthquakes, volcanoes, mountain building) that occur at plate boundaries, and impact of plate motions on societies and the environment (e.g., earthquakes, volcanoes);

(iii) describe the patterns and relationships in the circulation of air and water driven by the sun's radiant energy, including: 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;

(c) grades 9-12 performance standards on geochemical cycles:

(i) know that earth's system contains a fixed amount of natural resources that cycle among land, water, the atmosphere and living things (e.g., carbon and nitrogen cycles, rock cycle, water cycle, ground water, aquifers);

~~**(ii)** describe the composition and structure of earth's materials, including: the major rock types (i.e., sedimentary, igneous, metamorphic) and their formation, and natural resources (e.g., minerals, petroleum) and their formation;~~

~~**(iii)** explain how layers of the atmosphere (e.g., ozone, ionosphere) change naturally and artificially;~~

~~**(iv)** explain how the availability of ground water through aquifers can fluctuate based on multiple factors (i.e., rate of use, rate of replenishment, surface changes and changes in temperature).~~

~~**E.** Strand 3: Science and society. Content standard 1: Students will understand how scientific discoveries, inventions, practices and knowledge influence and are influenced by individuals and societies. Students will:~~

~~**(1)** grades 9-12 benchmark 1: examine and analyze how scientific discoveries and their applications affect the world and explain how societies influence scientific investigations and applications;~~

~~**(a)** grades 9-12 performance standards on science and technology:~~

~~**(i)** know how science enables technology but also constrains it, and describe 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);~~

~~**(ii)** understand how advances in technology enable further advances in science (e.g., microscopes and cellular structure, telescopes and understanding of the universe);~~

~~**(iii)** evaluate the influences of technology on society (e.g., communications, petroleum, transportation, nuclear energy, computers, medicine, genetic engineering) including both desired and undesired effects and including some historical examples (e.g., the wheel, the plow, the printing press, the lightning rod);~~

~~**(iv)** understand the scientific foundations of common technologies (e.g., kitchen appliances, radio, television, aircraft, rockets, computers, medical x-rays, selective breeding, fertilizers and pesticides, agricultural equipment);~~

~~**(v)** understand that applications of genetics can meet human needs and can create new problems (e.g., agriculture, medicine, cloning);~~

~~**(vi)** analyze the impact of digital technologies on the availability, creation and dissemination of information;~~

~~**(vii)** describe how human activities have affected ozone in the upper atmosphere and how it affects human health and the environment;~~

~~**(viii)** describe uses of radioactivity (e.g., nuclear power, nuclear medicine, radiometric dating);~~

~~**(b)** grades 9-12 performance standards on science and society:~~

~~**(i)** describe how scientific knowledge helps decision makers with local, national and global challenges (e.g., the waste isolation pilot project -WIPP, mining, drought, population growth, alternative energy, climate change);~~

~~**(ii)** describe major historical changes in scientific perspectives (e.g., atomic theory, germs, cosmology, relativity, plate tectonics, evolution) and the experimental observations that triggered them;~~

~~**(iii)** know that societal factors can promote or constrain scientific discovery (e.g., government funding, laws and regulations about human cloning and genetically modified organisms, gender and ethnic biases, AIDS research, alternative energy research);~~

~~**(iv)** explain how societies can change ecosystems and how these changes can be reversible or irreversible;~~

~~**(v)** describe how environmental, economic and political interests impact resource management and use in New Mexico;~~

~~**(vi)** describe New Mexico's role in nuclear science (e.g., Manhattan project, WIPP, national laboratories);~~

~~**(c)** grades 9-12 performance standards on science and individuals:~~

~~**(i)** identify how science has produced knowledge that is relevant to individual health and material prosperity;~~

~~**(ii)** know 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);~~

~~**(iii)** identify important questions that scientists cannot answer (e.g., questions that are beyond today's science, decisions that science can only help to make, and questions that are inherently outside of the realm of science);~~

~~**(iv)** understand that scientists have characteristics in common with other individuals (e.g., employment and career needs, curiosity, desire to perform public service, greed, preconceptions and biases, temptation to be unethical, core values including honesty and openness);~~

~~**(v)** know 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).~~]

[6.29.10.10 NMAC - Rp, 6.29.10.10 NMAC, 07/01/2018]

6.29.10.8 CONTENT STANDARDS WITH BENCHMARKS AND PERFORMANCE STANDARDS FOR SCIENCE, GRADES K-12: The New Mexico STEM-ready science standards established by the department are organized in grade levels as follows: K-12.

A. Performance expectations for grade K are organized into topical clusters as follows:

(1) Forces and interactions: pushes and pulls:

(a) K-PS2-1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

(b) K-PS2-2: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

(2) Interdependent relationships in ecosystems: animals, plants, and their environment:

(a) K-LS1-1: Use observations to describe patterns of what plants and animals (including humans) need to survive

(b) K-LS1-1 NM: Use observations of New Mexico plants and animals to describe patterns, that animals, need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.

(c) K-ESS2-2: Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

(d) K-ESS3-1: Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.

(e) K-ESS3-3: Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

(3) Weather and climate:

(a) K-PS3-1: Make observations to determine the effect of sunlight on Earth's surface.

(b) K-PS3-2: Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area

(c) K-ESS2-1: Use and share observations of local weather conditions to describe patterns over time.

(d) K-ESS3-2: Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.

(4) Engineering design:

(a) K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

(b) K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem

(c) K-2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

B. Performance expectations for grade 1 are organized into topical clusters as follows:

(1) Waves: light and sound:

(a) 1-PS4-1: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

(b) 1-PS4-2: Make observations to construct an evidence-based account that objects can be seen only when illuminated.

(c) 1-PS4-3: Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.

(d) 1-PS4-4: Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

(2) Structure, function, and information processing:

(a) 1-LS1-1: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

(b) 1-LS1-2: Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

(c) 1-LS3-1: Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

(3) Space systems: patterns and cycles:

(a) 1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted.

(b) 1-ESS1-2: Make observations at different times of year to relate the amount of daylight to the time of year.

(c) 1-ESS1-2 NM: Make observations at different times of year to relate the amount of daylight to the time of year emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring (e.g. snow melting, spring break, flowers) or fall (e.g. fall colors, starting school, state fair, balloon fiesta).

(4) New Mexico science and society:

(a) 1-NMSS-1: Read texts to discover that men and women of all ethnic and social backgrounds practice science and technology.

(b) 1-NMSS-2: Use media to discover that men and women of all ethnic and social backgrounds practice science and technology.

(5) Engineering design:

(a) K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

(b) K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

(c) K-2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

C. Performance expectations for grade 2 are organized into topical clusters as follows:

(1) Structure and properties of matter:

(a) 2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

(b) 2-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

(c) 2-PS1-3: Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

(d) 2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

(2) Interdependent relationships in ecosystems:

(a) 2-LS2-1: Plan and conduct an investigation to determine if plants need sunlight and water to grow.

(b) 2-LS2-2: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

(c) 2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats.

(3) Earth's systems: processes that shape the Earth:

(a) 2-ESS1-1: Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

(b) 2-ESS1-1 NM: Use information from several sources to provide evidence that Earth events can occur quickly or slowly. Although there are currently no active volcanoes in New Mexico, many extinct volcanoes exist throughout the state.

(c) 2-ESS2-1: Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

(d) 2-ESS2-2: Develop a model to represent the shapes and kinds of land and bodies of water in an area.

(e) 2-ESS2-2 NM: Develop a model to represent the state of New Mexico and the Rio Grande river and related water systems.

(f) 2-ESS2-3: Obtain information to identify where water is found on Earth and that it can be solid or liquid.

(g) 2-ESS2-3 NM: Obtain information to identify where fresh water is found on Earth, including the Rio Grande river and mountains.

(4) New Mexico science and society:

(a) 2-NMSS-1: Understand that everybody can do science, invent things, and formulate ideas.

(b) 2-NMSS-2: Use information from several sources to know that science has discovered many things about objects, events, and nature and there are many more questions to be answered.

(5) Engineering design:

(a) K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

(b) K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

(c) K-2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each.

D. Performance expectations for grade 3 are organized into topical clusters as follows:

(1) Forces and interactions:

(a) 3-PS2-1: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

(b) 3-PS2-2: Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

(c) 3-PS2-3: Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

(d) 3-PS2-4: Define a simple design problem that can be solved by applying scientific ideas about magnets.

(2) Interdependent relationships in ecosystems:

(a) 3-LS2-1: Construct an argument that some animals form groups that help members survive.

(b) 3-LS4-1: Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.

(c) 3-LS4-1 NM: Analyze and interpret data from fossils to provide evidence of the organisms and the environments include the state fossil Coelophysis, a theropod dinosaur.

(d) 3-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

(e) 3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

(3) Inheritance and variation of traits: life cycles and traits:

(a) 3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

(b) 3-LS3-1: Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

(c) 3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment.

(d) 3-LS3-2 NM: Obtain information on plants and animals in New Mexico and their ecosystems to use as evidence to support the explanation that traits can be influenced by the environment.

(e) 3-LS4-2: Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

(4) Weather and climate:

(a) 3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

(b) 3-ESS2-2: Obtain and combine information to describe climates in different regions of the world.

(c) 3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

(5) Engineering design:

(a) 3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

(b) 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem

(c) 3-5-ETS1-2: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

E. Performance expectations for grade 4 are organized into topical clusters as follows:

(1) Energy:

(a) 4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object.

(b) 4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

(c) 4-PS3-3: Ask questions and predict outcomes about the changes in energy that occur when objects collide.

(d) 4-PS3-4: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

(e) 4-ESS3-1: Obtain and combine information to describe that energy and fuels are derived from renewable and non-renewable resources and how their uses affect the environment.

(f) 4-ESS3-1 NM: Obtain and combine information to describe the energy sources in the school's community and New Mexico and how it benefits the community.

(2) Waves: waves and information:

(a) 4-PS4-1: Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

(b) 4-PS4-3: Generate and compare multiple solutions that use patterns to transfer information.

(3) Structure, function, and information processing:

(a) 4-PS4-2: Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

(b) 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

(c) 4-LS1-2: Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

(4) Earth's systems: processes that shape the Earth:

(a) 4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

(b) 4-ESS1-1 NM: Identify evidence from patterns in rock formations and fossils in rock layers to support possible explanations of New Mexico's geological changes over time.

(c) 4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

(d) 4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth's features.

(e) 4-ESS3-2: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

(f) 4-ESS3-2 NM: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on New Mexico's people and places.

(5) Engineering design:

(a) 3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

(b) 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem

(c) 3-5-ETS1-2: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

F. Performance expectations for grade 5 are organized into topical clusters as follows:

(1) Structure and properties of matter:

(a) 5-PS1-1: Develop a model to describe that matter is made of particles too small to be seen.

(b) 5-PS1-2: Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.

(c) 5-PS1-3: Make observations and measurements to identify materials based on their properties.

(d) 5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

(2) Matter and energy in organism and ecosystems:

(a) 5-PS3-1: Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

(b) 5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.

(c) 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

(3) Earth's systems: processes that shape the Earth:

(a) 5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

(b) 5-ESS2-1 NM: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact in New Mexico.

(c) 5-ESS2-2: Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

(d) 5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

(e) 5-ESS2-1 NM: Obtain and combine information about ways your school communities use science ideas to protect the Earth's resources and environment.

(4) Space systems: stars and the solar system:

(a) 5-PS2-1: Support an argument that the gravitational force exerted by Earth on objects is directed down.

(b) 5-ESS1-1: Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.

(c) 5-ESS1-2: Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

(5) New Mexico science and society:

(a) 5-NMSS-1: Use information to discover STEM careers throughout the state and know that both men and women of all races and social backgrounds have these careers.

(6) Engineering design:

(a) 3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

(b) 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem

(c) 3-5-ETS1-2: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

G. Performance expectations for grades 6-8 are organized into topical clusters as follows:

(1) Structure and properties of matter:

(a) MS-PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.

(b) MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

(c) MS-PS1-4: Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

(2) Chemical reactions:

(a) MS-PS1-2: Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

(b) MS-PS1-5: Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

(c) MS-PS1-6: Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

(3) Forces and interactions:

(a) MS-PS2-1: Apply Newton's third law to design a solution to a problem involving the motion of two colliding objects

(b) MS-PS2-2: Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

(c) MS-PS2-3: Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

(d) MS-PS2-4: Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

(e) MS-PS2-5: Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

(4) Energy:

(a) MS-PS3-1: Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

(b) MS-PS3-2: Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

(c) MS-PS3-3: Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

(d) MS-PS3-4: Plan an investigation to determine the relationships among the energy transferred the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

(e) MS-PS3-5: Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

(5) Waves and electromagnetic radiation:

(a) MS-PS4-1: Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.

(b) MS-PS4-2: Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

(c) MS-PS4-3: Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

(6) Structure, function, and information processing:

(a) MS-LS1-1: Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

(b) MS-LS1-2: Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

(c) MS-LS1-3: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

(d) MS-LS1-8: Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

(7) Matter and energy in organisms and ecosystems:

(a) MS-LS1-6: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

(b) MS-LS1-7: Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

(c) MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

(d) MS-LS2-1 NM: Analyze and interpret data to provide evidence for how organisms and populations (i.e. big horn Sheep, black bears, cougars, elk, deer, fish, coyote, wolves) exist together to create an ecosystem.

(e) MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

(f) MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

(g) MS-LS2-4 NM: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem in New Mexico (forest, grasslands, desert, bosque) affect populations.

(8) Interdependent relationships in ecosystems:

(a) MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

(b) MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

(c) MS-LS2-5 NM: Evaluate competing design solutions for maintaining biodiversity and ecosystem services in New Mexico (i.e. soil erosion protection, forest fire control, watershed planning, recycling, water purification and conservation).

(9) Growth, development, and reproduction of organisms:

(a) MS-LS1-4: Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

(b) MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

(c) MS-LS3-1: Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

(d) MS-LS3-2: Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

(e) MS-LS4-5: Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

(10) Natural selection and adaptations:

(a) MS-LS4-1: Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

(b) MS-LS4-2: Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.

(c) MS-LS4-4: Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.

(d) MS-LS4-6: Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

(11) Space systems:

(a) MS-ESS1-1: Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

(b) MS-ESS1-2: Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

(c) MS-ESS1-3: Analyze and interpret data to determine scale properties of objects in the solar system.

(12) History of Earth:

(a) MS-ESS1-4: Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's geologic history.

(b) MS-ESS2-2: Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

(c) MS-ESS2-3: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

(13) Earth's systems:

(a) MS-ESS2-1: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

(b) MS-ESS2-1 NM: Obtain and combine information to describe the impact of volcanoes and faults on New Mexico geology.

(c) MS-ESS2-4: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

(d) MS-ESS3-1: Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

(e) MS-ESS3-1 NM: Gather and synthesize information on what geologic processes/formations account for the concentrations of oil and gas in certain regions of New Mexico.

(14) Weather and climate:

(a) MS-ESS2-5: Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

(b) MS-ESS2-5 NM: Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions in New Mexico due to regional geography.

(c) MS-ESS2-6: Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

(d) MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the fluctuation in global temperatures over the past century.

(e) MS-ESS3-5 NM: Ask questions to clarify evidence of the factors that have caused the fluctuation in global temperatures, and consider the risks and benefits associated with technologies related to energy production.

(15) Human impacts:

(a) MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

(b) MS-ESS3-3: Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.

(c) MS-ESS3-3 NM: Describe the benefits associated with technologies related to the local industries and energy production.

(d) MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

(16) Engineering design:

(a) MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

(b) MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

(c) MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

(d) MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

H. Performance expectations for grade 9-12 are organized into topical clusters as follows:

(1) Structure and properties of matter:

(a) HS-PS1-1: Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

(b) HS-PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

(c) HS-PS1-8: Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

(d) HS-PS-8 NM: Describe New Mexico's role in nuclear science (Manhattan Project, WIPP, National Laboratories).

(e) HS-PS-8a NM: Explore and communicate a 21st Century innovation created by the National Laboratories in New Mexico that demonstrates how advances in technology enable further advances in science.

(f) HS-PS2-6: Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

(2) Chemical reactions:

(a) HS-PS1-2: Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

(b) HS-PS1-4: Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

(c) HS-PS1-5: Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

(d) HS-PS1-6: Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium

(e) HS-PS1-7: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

(3) Forces and reactions:

(a) HS-PS2-1: Analyze data to support the claim that newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

(b) HS-PS2-2: Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

(c) HS-PS2-3: Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision

(d) HS-PS2-4: Use mathematical representations of newton's law of gravitation and coulomb's law to describe and predict the gravitational and electrostatic forces between objects.

(e) HS-PS2-5: Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

(4) Energy:

(a) HS-PS3-1: Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

(b) HS-PS3-2: Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).

(c) HS-PS3-3: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy

(d) HS-PS3-4: Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

(e) HS-PS3-5: Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

(5) Waves and electromagnetic radiation:

(a) HS-PS4-1: Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

(b) HS-PS4-2: Evaluate questions about the advantages of using a digital transmission and storage of information.

(c) HS-PS4-3: Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

(d) HS-PS4-4: Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

(e) HS-PS4-5: Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

(6) Structure and function:

(a) HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

(b) HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

(c) HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

(7) Matter and Energy in organisms and ecosystems:

(a) HS-LS1-5: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

(b) HS-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

(c) HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

(d) HS-LS2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

(e) HS-LS2-4: Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

(f) HS-LS2-5: Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

(8) Interdependent relationships in ecosystems:

(a) HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

(b) HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

(c) HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

(d) HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity

(e) HS-LS2-7 NM: Using a local issue, in your solution design, include the benefits of human activities that support the local population including reclamation projects, building dams and habitat restoration.

(f) HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

(g) HS-LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

(h) HS-LS4-6 NM: Identify a problem within the school community and create or revise a simulation to test a solution to reduce impacts on biodiversity.

(9) Inheritance and variation of traits:

(a) HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

(b) HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

(c) HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

(d) HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

(10) Natural Selection and Evolution:

(a) HS-LS4-1: Analyze, interpret, and communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

(b) HS-LS4-2: Construct an explanation based on evidence that biological diversity is influenced by (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

(c) HS-LS4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

(d) HS-LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

(e) HS-LS4-5: Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

(11) Space systems:

(a) HS-ESS1-1: Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

(b) HS-ESS1-2: Construct an explanation of the big bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

(c) HS-ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements.

(d) HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

(12) History of Earth

(a) HS-ESS1-5: Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

(b) HS-ESS1-6: Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

(c) HS-ESS2-1: Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

(13) Earth's systems:

(a) HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

(b) HS-ESS2-3: Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

(c) HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

(d) HS-ESS2-6: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

(e) HS-ESS2-7: Construct an argument based on evidence about the evolution of Earth's systems and life on Earth.

(14) Weather and climate:

(a) HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

(b) HS-ESS2-4 NM: Use a model to describe how variations in the flow of energy into and out of Earth's systems that were caused by natural occurrences that are not related to human activity.

(c) HS-ESS3-5: Analyze data and the results from global climate models to make an evidence-based forecast of the current rate of global or climate fluctuation and associated future impacts to Earth systems.

(15) Human sustainability:

(a) HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

(b) HS-ESS3-2: Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios

(c) HS-ESS3-2 NM: Describe how scientific knowledge helps decision makers with New Mexico national and global challenges (e.g. waste isolation pilot project [WIPP], mining, oil and gas production, and population growth).

(d) HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

(e) HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

(f) HS-ESS3-4 NM: Evaluate the influences of technology on society (e.g., communications, petroleum, transportation, nuclear energy) including desired and undesired effects, and including some historical examples (e.g. telegraph, printing press, model-t ford, discovery of electricity, manhattan project).

(g) HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified.

(h) HS-ESS3-6 NM: Explain how societies can change ecosystems and how these changes can be reversible or irreversible.

(16) New Mexico science and society:

(a) HS-NMSS-1: Identify important questions that science cannot answer (e.g., questions beyond today's science, decisions that science can only help make, and questions that are inherently outside of the realm of science).

(b) HS-NMSS-2: Identify ways that science plays a role in many different kinds of careers and activities (e.g., public service, legislators, teachers, farmers, ranchers, construction workers, ranchers, oil and gas workers, miners, movie industry support, landscapers, ski resort snowmakers).

(17) Engineering design:

(a) HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

(b) HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

(c) HS-ETS1-3: 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 possible social, cultural, and environmental impacts.

(d) HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

[6.29.10.8 NMAC - Rp, 6.29.10.8 NMAC, 07/01/2018]

6.29.10.9 NMAC - 6.29.10.10 NMAC: [RESERVED]

[6.29.10.8 NMAC - Rp, 6.29.10.9 NMAC and 6.29.10.10 NMAC, 7/1/2018]

HISTORY OF 6.29.10 NMAC:

Pre-NMAC HISTORY: The material in this part is derived from that previously filed with the State Records Center:

SDE 74-17, (Certificate No. 74-17), Minimum Educational Standards for New Mexico Schools, filed April 16, 1975.

SDE 76-9, (Certificate No. 76-9), Minimum Education Standards for New Mexico Schools, filed July 7, 1976.

SDE 78-9, Minimum Education Standards for New Mexico Schools, filed August 17, 1978.

SBE 80-4, Educational Standards for New Mexico Schools, filed September 10, 1980.

SBE 81-4, Educational Standards for New Mexico Schools, filed July 27, 1981.

SBE 82-4, Educational Standards for New Mexico Schools, Basic and Vocational Program Standards, filed November 16, 1982.

SBE Regulation No. 83-1, Educational Standards for New Mexico Schools, Basic and Vocational Program Standards, filed June 24, 1983.

SBE Regulation 84-7, Educational Standards for New Mexico Schools, Basic and Vocational Program Standards, filed August 27, 1984.

SBE Regulation 85-4, Educational Standards for New Mexico Schools, Basic, Special Education, and Vocational Programs, filed October 21, 1985.
SBE Regulation No. 86-7, Educational Standards for New Mexico Schools, filed September 2, 1986.
SBE Regulation No. 87-8, Educational Standards for New Mexico Schools, filed February 2, 1988.
SBE Regulation No. 88-9, Educational Standards for New Mexico Schools, filed October 28, 1988.
SBE Regulation No. 89-8, Educational Standards for New Mexico Schools, filed November 22, 1989.
SBE Regulation No. 90-2, Educational Standards for New Mexico Schools, filed September 7, 1990.
SBE Regulation No. 92-1, Standards for Excellence, filed January 3, 1992.

History of Repealed Material:
6.30.2 NMAC, Standards for Excellence, filed November 2, 2000 - Repealed effective June 30, 2009.
6.29.10 NMAC, Science, filed June 30, 2009 - Repealed effective July 1, 2018.

NMAC History:
6 NMAC 3.2, Standards for Excellence, filed October 17, 1996.
6.30.2 NMAC, Standards for Excellence, November 2, 2000, replaced by 6.29.1 NMAC, General Provisions; 6.29.2 NMAC, Arts Education; 6.29.3 NMAC, Career and Technical Education; 6.29.4 NMAC, English Language Arts; 6.29.5 NMAC, English Language Development; 6.29.6 NMAC, Health Education; 6.29.7 NMAC, Mathematics; 6.29.8 NMAC, Modern, Classical and Native Languages; 6.29.9 NMAC, Physical Education; 6.29.10 NMAC, Science; 6.29.11 NMAC, Social Studies; effective June 30, 2009. 6.29.10 NMAC - Science, filed June 30, 2009 was repealed and replaced by 6.29.10 NMAC - New Mexico STEM-Ready Science Standards, effective July 1, 2018.

TITLE 6 PRIMARY AND SECONDARY EDUCATION
CHAPTER 29 STANDARDS FOR EXCELLENCE
PART 10 NEW MEXICO STEM-READY SCIENCE STANDARDS

6.29.10.1 ISSUING AGENCY: Public Education Department, hereinafter the department.
[6.29.10.1 NMAC - Rp, 6.29.10.1 NMAC, 07/01/2018]

6.29.10.2 SCOPE: All public schools, state educational institutions and educational programs conducted in state institutions other than New Mexico military institute.
[6.29.10.2 NMAC - Rp, 6.29.10.2 NMAC, 07/01/2018]

6.29.10.3 STATUTORY AUTHORITY:

A. Section 22-2-2 NMSA 1978 grants the authority and responsibility for the assessment and evaluation of public schools, state-supported educational institutions and educational programs conducted in state institutions other than New Mexico military institute.

B. Section 22-2-2 NMSA 1978 directs the department to set graduation expectations and hold schools accountable. Section 22-2C-3 NMSA 1978 requires the department to adopt academic content and performance standards and to measure the performance of public schools in New Mexico.
[6.29.10.3 NMAC - Rp, 6.29.10.3 NMAC, 07/01/2018]

6.29.10.4 DURATION: Permanent.
[6.29.10.4 NMAC - Rp, 6.29.10.4 NMAC, 07/01/2018]

6.29.10.5 EFFECTIVE DATE: July 1, 2018, unless a later date is cited at the end of a section.
[6.29.10.5 NMAC - Rp, 6.29.10.5 NMAC, 07/01/2018]

6.29.10.6 OBJECTIVE: The department-approved New Mexico STEM-ready science standards provide a framework of required knowledge and skills in this field; they are mandated for grades K-12.
[6.29.10.6 NMAC - Rp, 6.29.10.6 NMAC, 07/01/2018]

6.29.10.7 DEFINITIONS: [RESERVED]

6.29.10.8 CONTENT STANDARDS WITH BENCHMARKS AND PERFORMANCE STANDARDS FOR SCIENCE, GRADES K-12: The New Mexico STEM-ready science standards established by the department are organized in grade levels as follows: K-12.

A. Performance expectations for grade K are organized into topical clusters as follows:

(1) Forces and interactions: pushes and pulls:

(a) K-PS2-1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

(b) K-PS2-2: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

(2) Interdependent relationships in ecosystems: animals, plants, and their environment:

(a) K-LS1-1: Use observations to describe patterns of what plants and animals (including humans) need to survive

(b) K-LS1-1 NM: Use observations of New Mexico plants and animals to describe patterns, that animals, need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.

(c) K-ESS2-2: Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

(d) K-ESS3-1: Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.

(e) K-ESS3-3: Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

(3) Weather and climate:

(a) K-PS3-1: Make observations to determine the effect of sunlight on Earth's surface.

(b) K-PS3-2: Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area

(c) K-ESS2-1: Use and share observations of local weather conditions to describe patterns over time.

(d) K-ESS3-2: Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.

(4) Engineering design:

(a) K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

(b) K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem

(c) K-2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

B. Performance expectations for grade 1 are organized into topical clusters as follows:

(1) Waves: light and sound:

(a) 1-PS4-1: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

(b) 1-PS4-2: Make observations to construct an evidence-based account that objects can be seen only when illuminated.

(c) 1-PS4-3: Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.

(d) 1-PS4-4: Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

(2) Structure, function, and information processing:

(a) 1-LS1-1: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

(b) 1-LS1-2: Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

(c) 1-LS3-1: Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

(3) Space systems: patterns and cycles:

(a) 1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted.

(b) 1-ESS1-2: Make observations at different times of year to relate the amount of daylight to the time of year.

(c) 1-ESS1-2 NM: Make observations at different times of year to relate the amount of daylight to the time of year emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring (e.g. snow melting, spring break, flowers) or fall (e.g. fall colors, starting school, state fair, balloon fiesta).

(4) New Mexico science and society:

(a) 1-NMSS-1: Read texts to discover that men and women of all ethnic and social backgrounds practice science and technology.

(b) 1-NMSS-2: Use media to discover that men and women of all ethnic and social backgrounds practice science and technology.

(5) Engineering design:

(a) K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

(b) K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

(c) K-2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

C. Performance expectations for grade 2 are organized into topical clusters as follows:

(1) Structure and properties of matter:

(a) 2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

(b) 2-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

(c) 2-PS1-3: Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

(d) 2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

(2) Interdependent relationships in ecosystems:

(a) 2-LS2-1: Plan and conduct an investigation to determine if plants need sunlight and water to grow.

(b) 2-LS2-2: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

(c) 2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats.

(3) Earth's systems: processes that shape the Earth:

(a) 2-ESS1-1: Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

(b) 2-ESS1-1 NM: Use information from several sources to provide evidence that Earth events can occur quickly or slowly. Although there are currently no active volcanoes in New Mexico, many extinct volcanoes exist throughout the state.

(c) 2-ESS2-1: Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

(d) 2-ESS2-2: Develop a model to represent the shapes and kinds of land and bodies of water in an area.

(e) 2-ESS2-2 NM: Develop a model to represent the state of New Mexico and the Rio Grande river and related water systems.

(f) 2-ESS2-3: Obtain information to identify where water is found on Earth and that it can be solid or liquid.

(g) 2-ESS2-3 NM: Obtain information to identify where fresh water is found on Earth, including the Rio Grande river and mountains.

(4) New Mexico science and society:

(a) 2-NMSS-1: Understand that everybody can do science, invent things, and formulate ideas.

(b) 2-NMSS-2: Use information from several sources to know that science has discovered many things about objects, events, and nature and there are many more questions to be answered.

(5) Engineering design:

(a) K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

(b) K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

(c) K-2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each.

D. Performance expectations for grade 3 are organized into topical clusters as follows:

(1) Forces and interactions:

(a) 3-PS2-1: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

(b) 3-PS2-2: Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

(c) 3-PS2-3: Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

(d) 3-PS2-4: Define a simple design problem that can be solved by applying scientific ideas about magnets.

(2) Interdependent relationships in ecosystems:

(a) 3-LS2-1: Construct an argument that some animals form groups that help members survive.

(b) 3-LS4-1: Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.

(c) 3-LS4-1 NM: Analyze and interpret data from fossils to provide evidence of the organisms and the environments include the state fossil Coelophysis, a theropod dinosaur.

(d) 3-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

(e) 3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

(3) Inheritance and variation of traits: life cycles and traits:

(a) 3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

(b) 3-LS3-1: Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

(c) 3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment.

(d) 3-LS3-2 NM: Obtain information on plants and animals in New Mexico and their ecosystems to use as evidence to support the explanation that traits can be influenced by the environment.

(e) 3-LS4-2: Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

(4) Weather and climate:

(a) 3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

(b) 3-ESS2-2: Obtain and combine information to describe climates in different regions of the world.

(c) 3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

(5) Engineering design:

(a) 3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

(b) 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem

(c) 3-5-ETS1-2: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

E. Performance expectations for grade 4 are organized into topical clusters as follows:

(1) Energy:

(a) 4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object.

(b) 4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

(c) 4-PS3-3: Ask questions and predict outcomes about the changes in energy that occur when objects collide.

(d) 4-PS3-4: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

(e) 4-ESS3-1: Obtain and combine information to describe that energy and fuels are derived from renewable and non-renewable resources and how their uses affect the environment.

(f) 4-ESS3-1 NM: Obtain and combine information to describe the energy sources in the school's community and New Mexico and how it benefits the community.

(2) Waves: waves and information:

(a) 4-PS4-1: Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

(b) 4-PS4-3: Generate and compare multiple solutions that use patterns to transfer information.

(3) Structure, function, and information processing:

(a) 4-PS4-2: Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

(b) 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

(c) 4-LS1-2: Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

(4) Earth's systems: processes that shape the Earth:

(a) 4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

(b) 4-ESS1-1 NM: Identify evidence from patterns in rock formations and fossils in rock layers to support possible explanations of New Mexico's geological changes over time.

(c) 4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

(d) 4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth's features.

(e) 4-ESS3-2: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

(f) 4-ESS3-2 NM: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on New Mexico's people and places.

(5) Engineering design:

(a) 3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

(b) 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem

(c) 3-5-ETS1-2: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

F. Performance expectations for grade 5 are organized into topical clusters as follows:

(1) Structure and properties of matter:

(a) 5-PS1-1: Develop a model to describe that matter is made of particles too small to be seen.

(b) 5-PS1-2: Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.

(c) 5-PS1-3: Make observations and measurements to identify materials based on their properties.

(d) 5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

(2) Matter and energy in organism and ecosystems:

(a) 5-PS3-1: Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

(b) 5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.

(c) 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

(3) Earth's systems: processes that shape the Earth:

(a) 5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

(b) 5-ESS2-1 NM: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact in New Mexico.

(c) 5-ESS2-2: Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

(d) 5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

(e) 5-ESS2-1 NM: Obtain and combine information about ways your school communities use science ideas to protect the Earth's resources and environment.

(4) Space systems: stars and the solar system:

(a) 5-PS2-1: Support an argument that the gravitational force exerted by Earth on objects is directed down.

(b) 5-ESS1-1: Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.

(c) 5-ESS1-2: Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

(5) New Mexico science and society:

(a) 5-NMSS-1: Use information to discover STEM careers throughout the state and know that both men and women of all races and social backgrounds have these careers.

(6) Engineering design:

(a) 3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

(b) 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem

(c) 3-5-ETS1-2: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

G. Performance expectations for grades 6-8 are organized into topical clusters as follows:

(1) Structure and properties of matter:

(a) MS-PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.

(b) MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

(c) MS-PS1-4: Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

(2) Chemical reactions:

(a) MS-PS1-2: Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

(b) MS-PS1-5: Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

(c) MS-PS1-6: Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

(3) Forces and interactions:

(a) MS-PS2-1: Apply Newton's third law to design a solution to a problem involving the motion of two colliding objects

(b) MS-PS2-2: Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

(c) MS-PS2-3: Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

(d) MS-PS2-4: Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

(e) MS-PS2-5: Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

(4) Energy:

(a) MS-PS3-1: Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

(b) MS-PS3-2: Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

(c) MS-PS3-3: Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

(d) MS-PS3-4: Plan an investigation to determine the relationships among the energy transferred the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

(e) MS-PS3-5: Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

(5) Waves and electromagnetic radiation:

(a) MS-PS4-1: Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.

(b) MS-PS4-2: Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

(c) MS-PS4-3: Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

(6) Structure, function, and information processing:

(a) MS-LS1-1: Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

(b) MS-LS1-2: Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

(c) MS-LS1-3: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

(d) MS-LS1-8: Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

(7) Matter and energy in organisms and ecosystems:

(a) MS-LS1-6: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

(b) MS-LS1-7: Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

(c) MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

(d) MS-LS2-1 NM: Analyze and interpret data to provide evidence for how organisms and populations (i.e. big horn Sheep, black bears, cougars, elk, deer, fish, coyote, wolves) exist together to create an ecosystem.

(e) MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

(f) MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

(g) MS-LS2-4 NM: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem in New Mexico (forest, grasslands, desert, bosque) affect populations.

(8) Interdependent relationships in ecosystems:

(a) MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

(b) MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

(c) MS-LS2-5 NM: Evaluate competing design solutions for maintaining biodiversity and ecosystem services in New Mexico (i.e. soil erosion protection, forest fire control, watershed planning, recycling, water purification and conservation).

(9) Growth, development, and reproduction of organisms:

(a) MS-LS1-4: Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

(b) MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

(c) MS-LS3-1: Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

(d) MS-LS3-2: Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

(e) MS-LS4-5: Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

(10) Natural selection and adaptations:

(a) MS-LS4-1: Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

(b) MS-LS4-2: Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.

(c) MS-LS4-4: Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.

(d) MS-LS4-6: Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

(11) Space systems:

(a) MS-ESS1-1: Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

(b) MS-ESS1-2: Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

(c) MS-ESS1-3: Analyze and interpret data to determine scale properties of objects in the solar system.

(12) History of Earth:

(a) MS-ESS1-4: Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's geologic history.

(b) MS-ESS2-2: Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

(c) MS-ESS2-3: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

(13) Earth's systems:

(a) MS-ESS2-1: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

(b) MS-ESS2-1 NM: Obtain and combine information to describe the impact of volcanoes and faults on New Mexico geology.

(c) MS-ESS2-4: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

(d) MS-ESS3-1: Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

(e) MS-ESS3-1 NM: Gather and synthesize information on what geologic processes/formations account for the concentrations of oil and gas in certain regions of New Mexico.

(14) Weather and climate:

(a) MS-ESS2-5: Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

(b) MS-ESS2-5 NM: Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions in New Mexico due to regional geography.

(c) MS-ESS2-6: Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

(d) MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the fluctuation in global temperatures over the past century.

(e) MS-ESS3-5 NM: Ask questions to clarify evidence of the factors that have caused the fluctuation in global temperatures, and consider the risks and benefits associated with technologies related to energy production.

(15) Human impacts:

(a) MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

(b) MS-ESS3-3: Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.

(c) MS-ESS3-3 NM: Describe the benefits associated with technologies related to the local industries and energy production.

(d) MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

(16) Engineering design:

(a) MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

(b) MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

(c) MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

(d) MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

H. Performance expectations for grade 9-12 are organized into topical clusters as follows:

(1) Structure and properties of matter:

(a) HS-PS1-1: Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

(b) HS-PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

(c) HS-PS1-8: Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

(d) HS-PS-8 NM: Describe New Mexico's role in nuclear science (Manhattan Project, WIPP, National Laboratories).

(e) HS-PS-8a NM: Explore and communicate a 21st Century innovation created by the National Laboratories in New Mexico that demonstrates how advances in technology enable further advances in science.

(f) HS-PS2-6: Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

(2) Chemical reactions:

(a) HS-PS1-2: Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

(b) HS-PS1-4: Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

(c) HS-PS1-5: Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

(d) HS-PS1-6: Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium

(e) HS-PS1-7: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

(3) Forces and reactions:

(a) HS-PS2-1: Analyze data to support the claim that newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

(b) HS-PS2-2: Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

(c) HS-PS2-3: Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision

(d) HS-PS2-4: Use mathematical representations of newton's law of gravitation and coulomb's law to describe and predict the gravitational and electrostatic forces between objects.

(e) HS-PS2-5: Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

(4) Energy:

(a) HS-PS3-1: Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

(b) HS-PS3-2: Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).

(c) HS-PS3-3: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy

(d) HS-PS3-4: Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

(e) HS-PS3-5: Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

(5) Waves and electromagnetic radiation:

(a) HS-PS4-1: Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

(b) HS-PS4-2: Evaluate questions about the advantages of using a digital transmission and storage of information.

(c) HS-PS4-3: Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

(d) HS-PS4-4: Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

(e) HS-PS4-5: Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

(6) Structure and function:

(a) HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

(b) HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

(c) HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

(7) Matter and Energy in organisms and ecosystems:

(a) HS-LS1-5: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

(b) HS-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

(c) HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

(d) HS-LS2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

(e) HS-LS2-4: Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

(f) HS-LS2-5: Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

(8) Interdependent relationships in ecosystems:

(a) HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

(b) HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

(c) HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

(d) HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity

(e) HS-LS2-7 NM: Using a local issue, in your solution design, include the benefits of human activities that support the local population including reclamation projects, building dams and habitat restoration.

(f) HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

(g) HS-LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

(h) HS-LS4-6 NM: Identify a problem within the school community and create or revise a simulation to test a solution to reduce impacts on biodiversity.

(9) Inheritance and variation of traits:

(a) HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

(b) HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

(c) HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

(d) HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

(10) Natural Selection and Evolution:

(a) HS-LS4-1: Analyze, interpret, and communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

(b) HS-LS4-2: Construct an explanation based on evidence that biological diversity is influenced by (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

(c) HS-LS4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

(d) HS-LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

(e) HS-LS4-5: Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

(11) Space systems:

(a) HS-ESS1-1: Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

(b) HS-ESS1-2: Construct an explanation of the big bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

(c) HS-ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements.

(d) HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

(12) History of Earth

(a) HS-ESS1-5: Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

(b) HS-ESS1-6: Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

(c) HS-ESS2-1: Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

(13) Earth's systems:

(a) HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

(b) HS-ESS2-3: Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

(c) HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

(d) HS-ESS2-6: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

(e) HS-ESS2-7: Construct an argument based on evidence about the evolution of Earth's systems and life on Earth.

(14) Weather and climate:

(a) HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

(b) HS-ESS2-4 NM: Use a model to describe how variations in the flow of energy into and out of Earth's systems that were caused by natural occurrences that are not related to human activity.

(c) HS-ESS3-5: Analyze data and the results from global climate models to make an evidence-based forecast of the current rate of global or climate fluctuation and associated future impacts to Earth systems.

(15) Human sustainability:

(a) HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

(b) HS-ESS3-2: Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios

(c) HS-ESS3-2 NM: Describe how scientific knowledge helps decision makers with New Mexico national and global challenges (e.g. waste isolation pilot project [WIPP], mining, oil and gas production, and population growth).

(d) HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

(e) HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

(f) HS-ESS3-4 NM: Evaluate the influences of technology on society (e.g., communications, petroleum, transportation, nuclear energy) including desired and undesired effects, and including some historical examples (e.g. telegraph, printing press, model-t ford, discovery of electricity, manhattan project).

(g) HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified.

(h) HS-ESS3-6 NM: Explain how societies can change ecosystems and how these changes can be reversible or irreversible.

(16) New Mexico science and society:

(a) HS-NMSS-1: Identify important questions that science cannot answer (e.g., questions beyond today's science, decisions that science can only help make, and questions that are inherently outside of the realm of science).

(b) HS-NMSS-2: Identify ways that science plays a role in many different kinds of careers and activities (e.g., public service, legislators, teachers, farmers, ranchers, construction workers, ranchers, oil and gas workers, miners, movie industry support, landscapers, ski resort snowmakers).

(17) Engineering design:

(a) HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

(b) HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

(c) HS-ETS1-3: 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 possible social, cultural, and environmental impacts.

(d) HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

[6.29.10.8 NMAC - Rp, 6.29.10.8 NMAC, 07/01/2018]

6.29.10.9 NMAC - 6.29.10.10 NMAC: [RESERVED]
[6.29.10.8 NMAC - Rp, 6.29.10.9 NMAC and 6.29.10.10 NMAC, 7/1/2018]

HISTORY OF 6.29.10 NMAC:
Pre-NMAC HISTORY: The material in this part is derived from that previously filed with the State Records Center:
SDE 74-17, (Certificate No. 74-17), Minimum Educational Standards for New Mexico Schools, filed April 16, 1975.
SDE 76-9, (Certificate No. 76-9), Minimum Education Standards for New Mexico Schools, filed July 7, 1976.
SDE 78-9, Minimum Education Standards for New Mexico Schools, filed August 17, 1978.
SBE 80-4, Educational Standards for New Mexico Schools, filed September 10, 1980.
SBE 81-4, Educational Standards for New Mexico Schools, filed July 27, 1981.
SBE 82-4, Educational Standards for New Mexico Schools, Basic and Vocational Program Standards, filed November 16, 1982.
SBE Regulation No. 83-1, Educational Standards for New Mexico Schools, Basic and Vocational Program Standards, filed June 24, 1983.
SBE Regulation 84-7, Educational Standards for New Mexico Schools, Basic and Vocational Program Standards, filed August 27, 1984.
SBE Regulation 85-4, Educational Standards for New Mexico Schools, Basic, Special Education, and Vocational Programs, filed October 21, 1985.
SBE Regulation No. 86-7, Educational Standards for New Mexico Schools, filed September 2, 1986.
SBE Regulation No. 87-8, Educational Standards for New Mexico Schools, filed February 2, 1988.
SBE Regulation No. 88-9, Educational Standards for New Mexico Schools, filed October 28, 1988.
SBE Regulation No. 89-8, Educational Standards for New Mexico Schools, filed November 22, 1989.
SBE Regulation No. 90-2, Educational Standards for New Mexico Schools, filed September 7, 1990.
SBE Regulation No. 92-1, Standards for Excellence, filed January 3, 1992.

History of Repealed Material:
6.30.2 NMAC, Standards for Excellence, filed November 2, 2000 - Repealed effective June 30, 2009.
6.29.10 NMAC, Science, filed June 30, 2009 - Repealed effective July 1, 2018.

NMAC History:
6 NMAC 3.2, Standards for Excellence, filed October 17, 1996.
6.30.2 NMAC, Standards for Excellence, November 2, 2000, replaced by 6.29.1 NMAC, General Provisions; 6.29.2 NMAC, Arts Education; 6.29.3 NMAC, Career and Technical Education; 6.29.4 NMAC, English Language Arts; 6.29.5 NMAC, English Language Development; 6.29.6 NMAC, Health Education; 6.29.7 NMAC, Mathematics; 6.29.8 NMAC, Modern, Classical and Native Languages; 6.29.9 NMAC, Physical Education; 6.29.10 NMAC, Science; 6.29.11 NMAC, Social Studies; effective June 30, 2009. 6.29.10 NMAC - Science, filed June 30, 2009 was repealed and replaced by 6.29.10 NMAC - New Mexico STEM-Ready Science Standards, effective July 1, 2018.

Comparison of Next Generation Science Standards and New Mexico STEM-Ready Science Standards

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Next Generation Science Standards		Standard Ref. Number	New Mexico STEM-Ready Science Standards	
Standard Title	**Standard**		**Standard Title**	**Standard**
Motion and Stability: Forces and Interactions	Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.	**K-PS2-1**	Forces and Interactions: Pushes and Pulls	Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
Motion and Stability: Forces and Interactions	Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.	**K-PS2-2**	Forces and Interactions: Pushes and Pulls	Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.
From Molecules to Organisms: Structures and Processes	Use observations to describe patterns of what plants and animals (including humans) need to survive.	**K-LS1-1**	Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment	Use observations to describe patterns of what plants and animals (including humans) need to survive.
		K-LS1-1 NM	Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment	Use observations of New Mexico plants and animals to describe patterns, that animals, need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.
Earth's Systems	Use and share observations of local weather conditions to describe patterns over time.	**K-ESS2-1**	Weather and Climate	Use and share observations of local weather conditions to describe patterns over time.
Earth's Systems	Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.	**K-ESS2-2**	Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment	Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
Earth and Human Activity	Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.	**K-ESS3-1**	Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment	Use a model to represent the relationship between the needs of different plants ~~and~~ or animals (including humans) and the places they live.
Earth and Human Activity	Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.	**K-ESS3-2**	Weather and Climate	Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.

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Next Generation Science Standards		Standard Ref. Number	New Mexico STEM-Ready Science Standards	
Standard Title	**Standard**		**Standard Title**	**Standard**
Earth and Human Activity	Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.	**K-ESS3-3**	Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment	Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
Energy	Make observations to determine the effect of sunlight on Earth's surface.	**K-PS3-1**	Weather and Climate	Make observations to determine the effect of sunlight on Earth's surface.
Energy	Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.	**K-PS3-2**	Weather and Climate	Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.
Waves and Their Applications in Technologies for Information Transfer	Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.	**1-PS4-1**	Waves: Light and Sound	Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
Waves and Their Applications in Technologies for Information Transfer	Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.	**1-PS4-2**	Waves: Light and Sound	Make observations to construct an evidence-based account that objects ~~in darkness~~ can be seen only when illuminated.
Waves and Their Applications in Technologies for Information Transfer	Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.	**1-PS4-3**	Waves: Light and Sound	Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.
Waves and Their Applications in Technologies for Information Transfer	Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.	**1-PS4-4**	Waves: Light and Sound	Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.
From Molecules to Organisms: Structures and Processes	Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.	**1-LS1-1**	Structure, Function, and Information Processing	Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
From Molecules to Organisms: Structures and Processes	Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.	**1-LS1-2**	Structure, Function, and Information Processing	Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

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Next Generation Science Standards		Standard Ref. Number	New Mexico STEM-Ready Science Standards	
Standard Title	**Standard**		**Standard Title**	**Standard**
Heredity: Inheritance and Variation of Traits	Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.	**1-LS3-1**	Structure, Function, and Information Processing	Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
Earth's Place in the Universe	Use observations of the sun, moon, and stars to describe patterns that can be predicted.	**1-ESS1-1**	Space Systems: Patterns and Cycles	Use observations of the sun, moon, and stars to describe patterns that can be predicted.
Earth's Place in the Universe	Make observations at different times of year to relate the amount of daylight to the time of year.	**1-ESS1-2**	Space Systems: Patterns and Cycles	Make observations at different times of year to relate the amount of daylight to the time of year.
		1-ESS1-2 NM	Space Systems: Patterns and Cycles	Make observations at different times of year to relate the amount of daylight to the time of year emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring (e.g. snow melting, spring break, flowers) or fall (e.g. fall colors, starting school, state fair, balloon fiesta).
		1-NMSS-1	New Mexico Science and Society	Read texts to discover that men and women of all ethnic and social backgrounds practice science and technology.
		1-NMSS-2	New Mexico Science and Society	Use media to discover that men and women of all ethnic and social backgrounds practice science and technology.
Matter and Its Interactions	Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.	**2-PS1-1**	Structure and Properties of Matter	Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
Matter and Its Interactions	Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.	**2-PS1-2**	Structure and Properties of Matter	Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
Matter and Its Interactions	Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.	**2-PS1-3**	Structure and Properties of Matter	Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

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Standard Title	**Standard**		**Standard Title**	**Standard**
Matter and Its Interactions	Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.	**2-PS1-4**	Structure and Properties of Matter	Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
Ecosystems: Interactions, Energy, and Dynamics	Plan and conduct an investigation to determine if plants need sunlight and water to grow.	**2-LS2-1**	Interdependent Relationships in Ecosystems	Plan and conduct an investigation to determine if plants need sunlight and water to grow.
Ecosystems: Interactions, Energy, and Dynamics	Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.	**2-LS2-2**	Interdependent Relationships in Ecosystems	Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
Biological Evolution: Unity and Diversity	Make observations of plants and animals to compare the diversity of life in different habitats.	**2-LS4-1**	Interdependent Relationships in Ecosystems	Make observations of plants and animals to compare the diversity of life in different habitats.
Earth's Place in the Universe	Use information from several sources to provide evidence that Earth events can occur quickly or slowly.	**2-ESS1-1**	Earth's Systems: Processes that Shape the Earth	Use information from several sources to provide evidence that Earth events can occur quickly or slowly.
		2-ESS1-1 NM	Earth's Systems: Processes that Shape the Earth	Use information from several sources to provide evidence that Earth events can occur quickly or slowly. Although there are currently no active volcanoes in New Mexico, many extinct volcanoes exist throughout the state.
Earth's Systems	Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	**2-ESS2-1**	Earth's Systems: Processes that Shape the Earth	Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
Earth's Systems	Develop a model to represent the shapes and kinds of land and bodies of water in an area.	**2-ESS2-2**	Earth's Systems: Processes that Shape the Earth	Develop a model to represent the shapes and kinds of land and bodies of water in an area.
		2-ESS2-2 NM	Earth's Systems: Processes that Shape the Earth	Develop a model to represent the state of New Mexico and the Rio Grande river and related water systems.
Earth's Systems	Obtain information to identify where water is found on Earth and that it can be solid or liquid.	**2-ESS2-3**	Earth's Systems: Processes that Shape the Earth	Obtain information to identify where water is found on Earth and that it can be solid or liquid.

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Standard Title	**Standard**		**Standard Title**	**Standard**
		2-ESS2-3 NM	Earth's Systems: Processes that Shape the Earth	Obtain information to identify where fresh water is found on Earth, including the Rio Grande river and mountains.
		2-NMSS-1	New Mexico Science and Society	Understand that everybody can do science, invent things, and formulate ideas.
		2-NMSS-2	New Mexico Science and Society	Use information from several sources to know that science has discovered many things about objects, events, and nature and there are many more questions to be answered.
Engineering Design	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	**K-2-ETS1-1**	Engineering Design	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
Engineering Design	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	**K-2-ETS1-2**	Engineering Design	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
Engineering Design	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	**K-2-ETS1-3**	Engineering Design	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
Motion and Stability: Forces and Interactions	Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.	**3-PS2-1**	Forces and Interactions	Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
Motion and Stability: Forces and Interactions	Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.	**3-PS2-2**	Forces and Interactions	Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
Motion and Stability: Forces and Interactions	Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.	**3-PS2-3**	Forces and Interactions	Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
Motion and Stability: Forces and Interactions	Define a simple design problem that can be solved by applying scientific ideas about magnets.	**3-PS2-4**	Forces and Interactions	Define a simple design problem that can be solved by applying scientific ideas about magnets.

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Next Generation Science Standards		Standard Ref. Number	New Mexico STEM-Ready Science Standards	
Standard Title	**Standard**		**Standard Title**	**Standard**
From Molecules to Organisms: Structure and Processes	Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.	**3-LS1-1**	Inheritance and Variation of Traits: Life Cycles and Traits	Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
Ecosystems: Interactions, Energy, and Dynamics	Construct an argument that some animals form groups that help members survive.	**3-LS2-1**	Interdependent Relationships in Ecosystems	Construct an argument that some animals form groups that help members survive.
Heredity: Inheritance and Variation of Traits	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	**3-LS3-1**	Inheritance and Variation of Traits: Life Cycles and Traits	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.
Heredity: Inheritance and Variation of Traits	Use evidence to support the explanation that traits can be influenced by the environment.	**3-LS3-2**	Inheritance and Variation of Traits: Life Cycles and Traits	Use evidence to support the explanation that traits can be influenced by the environment.
		3-LS3-2 NM	Inheritance and Variation of Traits: Life Cycles and Traits	Obtain information on plants and animals in New Mexico and their ecosystems to use as evidence to support the explanation that traits can be influenced by the environment.
Biological Evlolution: Unity and Diversity	Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.	**3-LS4-1**	Interdependent Relationships in Ecosystems	Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
		3-LS4-1 NM	Interdependent Relationships in Ecosystems	Analyze and interpret data from fossils to provide evidence of the organisms and the environments include the state fossil Coelophysis, a theropod dinosaur.
Biological Evolution: Unity and Diversity	Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.	**3-LS4-2**	Inheritance and Variation of Traits: Life Cycles and Traits	Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
Biological Evolution: Unity and Diversity	Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	**3-LS4-3**	Interdependent Relationships in Ecosystems	Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

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Standard Title	**Standard**		**Standard Title**	**Standard**
Biological Evolution: Unity and Diversity	Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.	**3-LS4-4**	Interdependent Relationships in Ecosystems	Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
Earth's Systems	Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.	**3-ESS2-1**	Weather and Climate	Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
Earth's Systems	Obtain and combine information to describe climates in different regions of the world.	**3-ESS2-2**	Weather and Climate	Obtain and combine information to describe climates in different regions of the world.
Earth and Human Activity	Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.	**3-ESS3-1**	Weather and Climate	Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.
Energy	Use evidence to construct an explanation relating the speed of an object to the energy of that object.	**4-PS3-1**	Energy	Use evidence to construct an explanation relating the speed of an object to the energy of that object.
Energy	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.	**4-PS3-2**	Energy	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
Energy	Ask questions and predict outcomes about the changes in energy that occur when objects collide.	**4-PS3-3**	Energy	Ask questions and predict outcomes about the changes in energy that occur when objects collide.
Energy	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.	**4-PS3-4**	Energy	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
Waves and Their Applications in Technologies for Information Transfer	Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.	**4-PS4-1**	Waves: Waves and Information	Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
Waves and Their Applications in Technologies for Information Transfer	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.	**4-PS4-2**	Structure, Function, and Information Processing	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

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Waves and Their Applications in Technologies for Information Transfer	Generate and compare multiple solutions that use patterns to transfer information.	**4-PS4-3**	Waves: Waves and Information	Generate and compare multiple solutions that use patterns to transfer information.
From Molecules to Organisms: Structures and Processes	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	**4-LS1-1**	Structure, Function, and Information Processing	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
From Molecules to Organisms: Structures and Processes	Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.	**4-LS1-2**	Structure, Function, and Information Processing	Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
Earth's Place in the Universe	Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.	**4-ESS1-1**	Earth's Systems: Processes that Shape the Earth	Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
		4-ESS1-1 NM	Earth's Systems: Processes that Shape the Earth	Identify evidence from patterns in rock formations and fossils in rock layers to support possible explanations of New Mexico's geological changes over time.
Earth's Systems	Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.	**4-ESS2-1**	Earth's Systems: Processes that Shape the Earth	Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
Earth's Systems	Analyze and interpret data from maps to describe patterns of Earth's features.	**4-ESS2-2**	Earth's Systems: Processes that Shape the Earth	Analyze and interpret data from maps to describe patterns of Earth's features.
Earth and Human Activity	Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.	**4-ESS3-1**	Energy	Obtain and combine information to describe that energy and fuels are derived from ~~natural~~ renewable and non-renewable resources and how their uses affect the environment.
		4-ESS3-1 NM	Energy	Obtain and combine information to describe the energy sources in the school's community and New Mexico and how it benefits the community.

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Earth and Human Activity	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.	**4-ESS3-2**	Earth's Systems: Processes that Shape the Earth	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
		4-ESS3-2 NM	Earth's Systems: Processes that Shape the Earth	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on New Mexico's people and places.
Matter and Its Interactions	Develop a model to describe that matter is made of particles too small to be seen.	**5-PS1-1**	Structure and Properties of Matter	Develop a model to describe that matter is made of particles too small to be seen.
Matter and Its Interactions	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.	**5-PS1-2**	Structure and Properties of Matter	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
Matter and Its Interactions	Make observations and measurements to identify materials based on their properties.	**5-PS1-3**	Structure and Properties of Matter	Make observations and measurements to identify materials based on their properties.
Matter and Its Interactions	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	**5-PS1-4**	Structure and Properties of Matter	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
Motion and Stability: Forces and Interactions	Support an argument that the gravitational force exerted by Earth on objects is directed down.	**5-PS2-1**	Space Systems: Stars and the Solar System	Support an argument that the gravitational force exerted by Earth on objects is directed down.
Energy	Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.	**5-PS3-1**	Matter and Energy in Organism and Ecosystems	Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.
From Molecules to Organisms: Structures and Processes	Support an argument that plants get the materials they need for growth chiefly from air and water.	**5-LS1-1**	Matter and Energy in Organism and Ecosystems	Support an argument that plants get the materials they need for growth chiefly from air and water.
Ecosystems: Interactions, Energy, and Dynamics	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	**5-LS2-1**	Matter and Energy in Organism and Ecosystems	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
Earth's Place in the Universe	Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.	**5-ESS1-1**	Space Systems: Stars and the Solar System	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.

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Standard Title	**Standard**		**Standard Title**	**Standard**
Earth's Place in the Universe	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.	**5-ESS1-2**	Space Systems: Stars and the Solar System	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
Earth's Systems	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.	**5-ESS2-1**	Earth's Systems: Processes that Shape the Earth	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
		5-ESS2-1 NM	Earth's Systems: Processes that Shape the Earth	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact in New Mexico.
Earth's Systems	Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.	**5-ESS2-2**	Earth's Systems: Processes that Shape the Earth	Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
		5-ESS2-1 NM	Earth's Systems: Processes that Shape the Earth	Obtain and combine information about ways your school communities use science ideas to protect the Earth's resources and environment.
Earth and Human Activity	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	**5-ESS3-1**	Earth's Systems: Processes that Shape the Earth	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
		5-NMSS-1	New Mexico Science and Society	Use information to discover STEM careers throughout the state and know that both men and women of all races and social backgrounds have these careers.
Engineering Design	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.	**3-5-ETS1-1**	Engineering Design	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
Engineering Design	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	**3-5-ETS1-2**	Engineering Design	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

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Engineering Design	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	**3-5-ETS1-2**	Engineering Design	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
Matter and Its Interactions	Develop models to describe the atomic composition of simple molecules and extended structures.	**MS-PS1-1**	Structure and Properties of Matter	Develop models to describe the atomic composition of simple molecules and extended structures.
Matter and Its Interactions	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	**MS-PS1-2**	Chemical Reactions	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
Matter and Its Interactions	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	**MS-PS1-3**	Structure and Properties of Matter	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
Matter and Its Interactions	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.	**MS-PS1-4**	Structure and Properties of Matter	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
Matter and Its Interactions	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.	**MS-PS1-5**	Chemical Reactions	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
Matter and Its Interactions	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.	**MS-PS1-6**	Chemical Reactions	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
Motion and Stability: Forces and Interactions	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.	**MS-PS2-1**	Forces and Interactions	Apply Newton's third law to design a solution to a problem involving the motion of two colliding objects.
Motion and Stability: Forces and Interactions	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	**MS-PS2-2**	Forces and Interactions	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

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Standard Title	**Standard**		**Standard Title**	**Standard**
Motion and Stability: Forces and Interactions	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.	**MS-PS2-3**	Forces and Interactions	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
Motion and Stability: Forces and Interactions	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.	**MS-PS2-4**	Forces and Interactions	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
Motion and Stability: Forces and Interactions	Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.	**MS-PS2-5**	Forces and Interactions	Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
Energy	Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.	**MS-PS3-1**	Energy	Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
Energy	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.	**MS-PS3-2**	Energy	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
Energy	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.	**MS-PS3-3**	Energy	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
Energy	Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.	**MS-PS3-4**	Energy	Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
Energy	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.	**MS-PS3-5**	Energy	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

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Standard Title	**Standard**		**Standard Title**	**Standard**
Waves and Their Application in Technologies for Information Transfer	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.	**MS-PS4-1**	Waves and Electromagnetic Radiation	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
Waves and Their Application in Technologies for Information Transfer	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	**MS-PS4-2**	Waves and Electromagnetic Radiation	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
Waves and Their Application in Technologies for Information Transfer	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.	**MS-PS4-3**	Waves and Electromagnetic Radiation	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.
From Molecules to Organisms: Structures and Processes	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.	**MS-LS1-1**	Structure, Function, and Information Processing	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
From Molecules to Organisms: Structures and Processes	Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.	**MS-LS1-2**	Structure, Function, and Information Processing	Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
From Molecules to Organisms: Structures and Processes	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.	**MS-LS1-3**	Structure, Function, and Information Processing	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
From Molecules to Organisms: Structures and Processes	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	**MS-LS1-4**	Growth, Development, and Reproduction of Organisms	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
From Molecules to Organisms: Structures and Processes	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	**MS-LS1-5**	Growth, Development, and Reproduction of Organisms	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
From Molecules to Organisms: Structures and Processes	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	**MS-LS1-6**	Matter and Energy in Organisms and Ecosystems	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

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From Molecules to Organisms: Structures and Processes	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.	**MS-LS1-7**	Matter and Energy in Organisms and Ecosystems	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
From Molecules to Organisms: Structures and Processes	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	**MS-LS1-8**	Structure, Function, and Information Processing	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
Ecosystems: Interactions, Energy, and Dynamics	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	**MS-LS2-1**	Matter and Energy in Organisms and Ecosystems	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
		MS-LS2-1 NM	Matter and Energy in Organisms and Ecosystems	Analyze and interpret data to provide evidence for how organisms and populations (i.e. big horn Sheep, black bears, cougars, elk, deer, fish, coyote, wolves) exist together to create an ecosystem.
Ecosystems: Interactions, Energy, and Dynamics	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	**MS-LS2-2**	Interdependent Relationships in Ecosystems	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
Ecosystems: Interactions, Energy, and Dynamics	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	**MS-LS2-3**	Matter and Energy in Organisms and Ecosystems	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
Ecosystems: Interactions, Energy, and Dynamics	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	**MS-LS2-4**	Matter and Energy in Organisms and Ecosystems	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
		MS-LS2-4 NM	Matter and Energy in Organisms and Ecosystems	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem in New Mexico (forest, grasslands, desert, bosque) affect populations.

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Ecosystems: Interactions, Energy, and Dynamics	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	**MS-LS2-5**	Interdependent Relationships in Ecosystems	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
		MS-LS2-5 NM	Interdependent Relationships in Ecosystems	Evaluate competing design solutions for maintaining biodiversity and ecosystem services in New Mexico (i.e. soil erosion protection, forest fire control, watershed planning, recycling, water purification and conservation).
Heredity: Inheritance and Variation of Traits	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.	**MS-LS3-1**	Growth, Development, and Reproduction of Organisms	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
Heredity: Inheritance and Variation of Traits	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.	**MS-LS3-2**	Growth, Development, and Reproduction of Organisms	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
Biological Evolution: Unity and Diversity	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.	**MS-LS4-1**	Natural Selection and Adaptations	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
Biological Evolution: Unity and Diversity	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.	**MS-LS4-2**	Natural Selection and Adaptations	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
Biological Evolution: Unity and Diversity	Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.	**MS-LS4-3**		~~Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.~~

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Biological Evolution: Unity and Diversity	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	**MS-LS4-4**	Natural Selection and Adaptations	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
Biological Evolution: Unity and Diversity	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.	**MS-LS4-5**	Growth, Development, and Reproduction of Organisms	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
Biological Evolution: Unity and Diversity	Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	**MS-LS4-6**	Natural Selection and Adaptations	Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
Earth's Place in the Universe	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	**MS-ESS1-1**	Space Systems	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
Earth's Place in the Universe	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.	**MS-ESS1-2**	Space Systems	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
Earth's Place in the Universe	Analyze and interpret data to determine scale properties of objects in the solar system.	**MS-ESS1-3**	Space Systems	Analyze and interpret data to determine scale properties of objects in the solar system.
Earth's Place in the Universe	Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.	**MS-ESS1-4**	History of Earth	Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's ~~4.6-billion-year-old~~ geologic history.
Earth's Systems	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.	**MS-ESS2-1**	Earth's Systems	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
		MS-ESS2-1 NM	Earth's Systems	Obtain and combine information to describe the impact of volcanoes and faults on New Mexico geology.

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Earth's Systems	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.	**MS-ESS2-2**	History of Earth	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
Earth's Systems	Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.	**MS-ESS2-3**	History of Earth	Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
Earth's Systems	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.	**MS-ESS2-4**	Earth's Systems	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
Earth's Systems	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.	**MS-ESS2-5**	Weather and Climate	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
		MS-ESS2-5 NM	Weather and Climate	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions in New Mexico due to regional geography.
Earth's Systems	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.	**MS-ESS2-6**	Weather and Climate	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
Earth and Human Activity	Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.	**MS-ESS3-1**	Earth's Systems	Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
		MS-ESS3-1 NM	Earth's Systems	Gather and synthesize information on what geologic processes/formations account for the concentrations of oil and gas in certain regions of New Mexico.
Earth and Human Activity	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.	**MS-ESS3-2**	Human Impacts	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

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Earth and Human Activity	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	**MS-ESS3-3**	Human Impacts	Apply scientific principles to design a method for monitoring, ~~and minimizing~~ evaluating, and managing a human impact on the environment.
		MS-ESS3-3 NM	Human Impacts	Describe the benefits associated with technologies related to the local industries and energy production.
Earth and Human Activity	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	**MS-ESS3-4**	Human Impacts	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
Earth and Human Activity	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	**MS-ESS3-5**	Weather and Climate	Ask questions to clarify evidence of the factors that have caused the ~~rise~~ fluctuation in global temperatures over the past century.
		MS-ESS3-5 NM	Weather and Climate	Ask questions to clarify evidence of the factors that have caused the fluctuation in global temperatures, and consider the risks and benefits associated with technologies related to energy production.
Engineering Design	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	**MS-ETS1-1**	Engineering Design	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
Engineering Design	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	**MS-ETS1-2**	Engineering Design	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
Engineering Design	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	**MS-ETS1-3**	Engineering Design	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

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Engineering Design	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	**MS-ETS1-4**	Engineering Design	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
Matter and Its Interactions	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.	**HS-PS1-1**	Structure and Properties of Matter	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
Matter and Its Interactions	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.	**HS-PS1-2**	Chemical Reactions	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
Matter and Its Interactions	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.	**HS-PS1-3**	Structure and Properties of Matter	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
Matter and Its Interactions	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.	**HS-PS1-4**	Chemical Reactions	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
Matter and Its Interactions	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.	**HS-PS1-5**	Chemical Reactions	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
Matter and Its Interactions	Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.	**HS-PS1-6**	Chemical Reactions	Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
Matter and Its Interactions	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	**HS-PS1-7**	Chemical Reactions	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

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Matter and Its Interactions	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.	**HS-PS1-8**	Structure and Properties of Matter	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
		HS-PS-8 NM	Structure and Properties of Matter	Describe New Mexico's role in nuclear science (Manhattan Project, WIPP, National Laboratories).
		HS-PS-8a NM	Structure and Properties of Matter	Explore and communicate a 21st Century innovation created by the National Laboratories in New Mexico that demonstrates how advances in technology enable further advances in science.
Motion and Stability: Forces and Interactions	Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.	**HS-PS2-1**	Forces and Reactions	Analyze data to support the claim that newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
Motion and Stability: Forces and Interactions	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.	**HS-PS2-2**	Forces and Reactions	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
Motion and Stability: Forces and Interactions	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.	**HS-PS2-3**	Forces and Reactions	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
Motion and Stability: Forces and Interactions	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.	**HS-PS2-4**	Forces and Reactions	Use mathematical representations of newton's law of gravitation and coulomb's law to describe and predict the gravitational and electrostatic forces between objects.
Motion and Stability: Forces and Interactions	Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.	**HS-PS2-5**	Forces and Reactions	Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
Motion and Stability: Forces and Interactions	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.	**HS-PS2-6**	Structure and Properties of Matter	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Source: PED

Comparison of Next Generation Science Standards and New Mexico STEM-Ready Science Standards

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Next Generation Science Standards		Standard Ref. Number	New Mexico STEM-Ready Science Standards	
Standard Title	**Standard**		**Standard Title**	**Standard**
Energy	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.	**HS-PS3-1**	Energy	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
Energy	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).	**HS-PS3-2**	Energy	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).
Energy	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy	**HS-PS3-3**	Energy	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy
Energy	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).	**HS-PS3-4**	Energy	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
Energy	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.	**HS-PS3-5**	Energy	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.
Waves and Their Applications in Technologies for Information Transfer	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.	**HS-PS4-1**	Waves and Electromagnetic Radiation	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
Waves and Their Applications in Technologies for Information Transfer	Evaluate questions about the advantages of using digital transmission and storage of information.	**HS-PS4-2**	Waves and Electromagnetic Radiation	Evaluate questions about the advantages of using a digital transmission and storage of information.

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Waves and Their Applications in Technologies for Information Transfer	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.	**HS-PS4-3**	Waves and Electromagnetic Radiation	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
Waves and Their Applications in Technologies for Information Transfer	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.	**HS-PS4-4**	Waves and Electromagnetic Radiation	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
Waves and Their Applications in Technologies for Information Transfer	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.	**HS-PS4-5**	Waves and Electromagnetic Radiation	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.
From Molecules to Organisms: Structures and Processes	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.	**HS-LS1-1**	Structure and Function	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
From Molecules to Organisms: Structures and Processes	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	**HS-LS1-2**	Structure and Function	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
From Molecules to Organisms: Structures and Processes	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.	**HS-LS1-3**	Structure and Function	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
From Molecules to Organisms: Structures and Processes	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.	**HS-LS1-4**	Inheritance and Variation of Traits	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
From Molecules to Organisms: Structures and Processes	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	**HS-LS1-5**	Matter and Energy in Organisms and Ecosystems	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

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Standard Title	**Standard**		**Standard Title**	**Standard**
From Molecules to Organisms: Structures and Processes	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.	**HS-LS1-6**	Matter and Energy in Organisms and Ecosystems	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
From Molecules to Organisms: Structures and Processes	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	**HS-LS1-7**	Matter and Energy in Organisms and Ecosystems	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
Ecosystems: Interactions, Energy, and Dynamics	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.	**HS-LS2-1**	Interdependent Relationships in Ecosystems	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
Ecosystems: Interactions, Energy, and Dynamics	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.	**HS-LS2-2**	Interdependent Relationships in Ecosystems	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
Ecosystems: Interactions, Energy, and Dynamics	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.	**HS-LS2-3**	Matter and Energy in Organisms and Ecosystems	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
Ecosystems: Interactions, Energy, and Dynamics	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.	**HS-LS2-4**	Matter and Energy in Organisms and Ecosystems	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
Ecosystems: Interactions, Energy, and Dynamics	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.	**HS-LS2-5**	Matter and Energy in Organisms and Ecosystems	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
Ecosystems: Interactions, Energy, and Dynamics	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.	**HS-LS2-6**	Interdependent Relationships in Ecosystems	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

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Standard Title	**Standard**		**Standard Title**	**Standard**
Ecosystems: Interactions, Energy, and Dynamics	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.	**HS-LS2-7**	Interdependent Relationships in Ecosystems	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
		HS-LS2-7 NM	Interdependent Relationships in Ecosystems	Using a local issue, in your solution design, include the benefits of human activities that support the local population including reclamation projects, building dams and habitat restoration.
Ecosystems: Interactions, Energy, and Dynamics	Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.	**HS-LS2-8**	Interdependent Relationships in Ecosystems	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
Heredity: Inheritance and Variation of Traits	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.	**HS-LS3-1**	Inheritance and Variation of Traits	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
Heredity: Inheritance and Variation of Traits	Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.	**HS-LS3-2**	Inheritance and Variation of Traits	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
Heredity: Inheritance and Variation of Traits	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.	**HS-LS3-3**	Inheritance and Variation of Traits	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
Biological Evolution: Unity and Diversity	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.	**HS-LS4-1**	Natural Selection and Evolution	Analyze, interpret, and communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

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Standard Title	**Standard**		**Standard Title**	**Standard**
Biological Evolution: Unity and Diversity	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.	**HS-LS4-2**	Natural Selection and Evolution	Construct an explanation based on evidence that biological diversity ~~primarily results from four main factors~~ is influenced by (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
Biological Evolution: Unity and Diversity	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.	**HS-LS4-3**	Natural Selection and Evolution	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
Biological Evolution: Unity and Diversity	Construct an explanation based on evidence for how natural selection leads to adaptation of populations.	**HS-LS4-4**	Natural Selection and Evolution	Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
Biological Evolution: Unity and Diversity	Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	**HS-LS4-5**	Natural Selection and Evolution	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
Biological Evolution: Unity and Diversity	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	**HS-LS4-6**	Interdependent Relationships in Ecosystems	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
		HS-LS4-6 NM	Interdependent Relationships in Ecosystems	Identify a problem within the school community and create or revise a simulation to test a solution to reduce impacts on biodiversity.
Earth's Place in the Universe	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.	**HS-ESS1-1**	Space Systems	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

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Next Generation Science Standards		Standard Ref. Number	New Mexico STEM-Ready Science Standards	
Standard Title	**Standard**		**Standard Title**	**Standard**
Earth's Place in the Universe	Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.	**HS-ESS1-2**	Space Systems	Construct an explanation of the big bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
Earth's Place in the Universe	Communicate scientific ideas about the way stars, over their life cycle, produce elements.	**HS-ESS1-3**	Space Systems	Communicate scientific ideas about the way stars, over their life cycle, produce elements.
Earth's Place in the Universe	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.	**HS-ESS1-4**	Space Systems	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
Earth's Place in the Universe	Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.	**HS-ESS1-5**	History of Earth	Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
Earth's Place in the Universe	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.	**HS-ESS1-6**	History of Earth	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
Earth's Systems	Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.	**HS-ESS2-1**	History of Earth	Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
Earth's Systems	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.	**HS-ESS2-2**	Earth's Systems	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
Earth's Systems	Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.	**HS-ESS2-3**	Earth's Systems	Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
Earth's Systems	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.	**HS-ESS2-4**	Weather and Climate	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

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		HS-ESS2-4 NM	Weather and Climate	Use a model to describe how variations in the flow of energy into and out of Earth's systems that were caused by natural occurrences that are not related to human activity.
Earth's Systems	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.	**HS-ESS2-5**	Earth's Systems	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
Earth's Systems	Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.	**HS-ESS2-6**	Earth's Systems	Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
Earth's Systems	Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.	**HS-ESS2-7**	Earth's Systems	Construct an argument based on evidence about the ~~simultaneous coevolution~~ evolution of Earth's systems and life on Earth.
Earth and Human Activity	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.	**HS-ESS3-1**	Human Sustainability	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
Earth and Human Activity	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.	**HS-ESS3-2**	Human Sustainability	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
		HS-ESS3-2 NM	Human Sustainability	Describe how scientific knowledge helps decision makers with New Mexico national and global challenges (e.g. waste isolation pilot project [WIPP], mining, oil and gas production, and population growth).
Earth and Human Activity	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.	**HS-ESS3-3**	Human Sustainability	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
Earth and Human Activity	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	**HS-ESS3-4**	Human Sustainability	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

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		HS-ESS3-4 NM	Human Sustainability	Evaluate the influences of technology on society (e.g., communications, petroleum, transportation, nuclear energy) including desired and undesired effects, and including some historical examples (e.g. telegraph, printing press, model-t ford, discovery of electricity, manhattan project).
Earth and Human Activity	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.	**HS-ESS3-5**	Weather and Climate	Analyze ~~geoscience~~ data and the results from global climate models to make an evidence-based forecast of the current rate of global or ~~regional~~ climate ~~change~~ fluctuation and associated future impacts to Earth systems.
Earth and Human Activity	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.	**HS-ESS3-6**	Human Sustainability	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified ~~due to human activity~~.
		HS-ESS3-6 NM	Human Sustainability	Explain how societies can change ecosystems and how these changes can be reversible or irreversible.
		HS-NMSS-1	New Mexico Science and Society	Identify important questions that science cannot answer (e.g., questions beyond today's science, decisions that science can only help make, and questions that are inherently outside of the realm of science).
		HS-NMSS-2	New Mexico Science and Society	Identify ways that science plays a role in many different kinds of careers and activities (e.g., public service, legislators, teachers, farmers, ranchers, construction workers, ranchers, oil and gas workers, miners, movie industry support, landscapers, ski resort snowmakers).
Engineering Design	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	**HS-ETS1-1**	Engineering Design	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

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Engineering Design	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	**HS-ETS1-2**	Engineering Design	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
Engineering Design	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 possible social, cultural, and environmental impacts.	**HS-ETS1-3**	Engineering Design	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 possible social, cultural, and environmental impacts.
Engineering Design	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.	**HS-ETS1-4**	Engineering Design	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

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Age of the Earth	
Designation	**Performance Standard**
• Strand II. Content of Science • Standard III. (Earth and Space Science) Understand the structure of Earth, the solar system, and the universe, the interconnections among them, and the processes and interactions of Earth's systems. • 5-8 Benchmark II. Describe the structure of Earth and its atmosphere and explain how energy, matter, and forces shape Earth's systems. • Grade 7.	Performance Standard 1. Understand how the remains of living things give us information about the history of Earth, including layers of sedimentary rock, the fossil record, and radioactive dating showing that life has been present on Earth for more than 3.5 billion years.
• Strand II. Content of Science • Standard II. (Life Science) Understand the properties, structures, and processes of living things and the interdependence of living things and their environments. • Grade 9-12 Benchmark II Understand the genetic basis for inheritance and the basic concepts of biological evolution. • Grade 9-12.	Performance Standard 8. Describe the evidence for the first appearance of life on Earth as one-celled organisms, over 3.5 billion years ago, and for the later appearance of a diversity of multicellular organisms over millions of years.
• Strand II. Content of Science • Standard III. (Earth and Space Science) Understand the structure of Earth, the solar system, and the universe, the interconnections among them, and the processes and interactions of Earth's systems. • 9-12 Benchmark I. Examine the scientific theories of the origin, structure, contents, and evolution of the solar system and the universe, and their interconnections. • Grade 9-12.	Performance Standard 4. Describe the key observations that led to the acceptance of the Big Bang theory and that the age of the universe is over 10 billion years.
• Strand II. Content of Science • Standard III. (Earth and Space Science) Understand the structure of Earth, the solar system, and the universe, the interconnections among them, and the processes and interactions of Earth's systems.	Performance Standard 2. Recognize that radiometric data indicate that Earth is at least 4 billion years old and that Earth has changed during that period.

Age of the Earth	
Designation	**Performance Standard**
• 9-12 Benchmark II. Examine the scientific theories of the origin, structure, energy, and evolution of Earth and its atmosphere, and their interconnections. • Grade 9-12.	

Evolution	
Designation	**Performance Standard**
• Strand II. Content of Science • Standard II. (Life Science) Understand the properties, structures, and processes of living things and the interdependence of living things and their environments. • 5-8 Benchmark II. Describe the structure of Earth and its atmosphere and explain how energy, matter, and forces shape Earth's systems. • Grade 6.	Performance Standard 1. Understand that the fossil record provides data for how living organisms have evolved. Performance Standard 11. Understand the process of natural selection.
• Strand II. Content of Science • Standard II. (Life Science) Understand the properties, structures, and processes of living things and the interdependence of living things and their environments. • Grade 9-12 Benchmark I. Understand how the survival of species depends on biodiversity and on complex interactions, including the cycling of matter and the flow of energy. • Grade 9-12.	Performance Standard 8. Understand and explain the hierarchical classification scheme (i.e., domain, kingdom, phylum, class, order, family, genus, species), including: • classification of an organism into a category; • similarity inferred from molecular structure (DNA) closely matching classification based on anatomical similarities; • similarities of organisms reflecting evolutionary relationships. Performance Standard 9. Understand variation within and among species, including: • mutations and genetic drift; • factors affecting the survival of an organism; • natural selection.
• Strand II. Content of Science • Standard II. (Life Science) Understand the properties, structures, and processes of living things and the interdependence of living things and their environments. • Grade 9-12 Benchmark II. Understand the genetic basis for inheritance and the basic concepts of biological evolution. • Grade 9-12.	Performance Standard 8. Describe the evidence for the first appearance of life on Earth as one-celled organisms, over 3.5 billion years ago, and for the later appearance of a diversity of multicellular organisms over millions of years. Performance Standard 9. Critically analyze the data and observations supporting the conclusion that the species living on Earth today are related by descent from the ancestral one-celled organisms. Performance Standard 10. Understand the data, observations, and logic supporting the conclusion that species today evolved from

Evolution	
Designation	**Performance Standard**
	earlier, distinctly different species, originating from the ancestral one-celled organisms. Performance Standard 11. Understand 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. Performance Standard 13. Analyze how evolution by natural selection and other mechanisms explains many phenomena including the fossil record of ancient life forms and similarities (both physical and molecular) among different species.

Climate Change	
Designation	**Performance Standard**
• Strand II. Content of Science • Standard II. (Life Science) Understand the properties, structures, and processes of living things and the interdependence of living things and their environments. • 5-8 Benchmark I. Explain the diverse structures and functions of living things and the complex relationships between living things and their environments. • Grade 8.	Performance Standard 3. Explain how a change in the flow of energy can impact an ecosystem (e.g., the amount of sunlight available for plant growth, global climate change).
• Strand II. Content of Science • Standard III. (Earth and Space Science) Understand the structure of Earth, the solar system, and the universe, the interconnections among them, and the processes and interactions of Earth's systems • Grade 9-12 Benchmark II. Examine the scientific theories of the origin, structure, energy, and evolution of Earth and its atmosphere, and their interconnections. • Grade 9-12.	Performance Standard 8. Describe the patterns and relationships in the circulation of air and water driven by the sun's radiant energy, including: • patterns in weather systems related to the transfer of energy; • differences between climate and weather; • global climate, global warming, and the greenhouse effect; • El Niño, La Niña, and other climatic trends.
• Strand III. Science and Society • Standard 1. • Grade 9-12 Benchmark I. Examine and analyze how scientific discoveries and their applications affect the world, and explain how societies influence scientific investigations and applications. • Grade 9-12.	Performance Standard 9. Describe how scientific knowledge helps decision makers with local, national, and global challenges (e.g., Waste Isolation Pilot Project [WIPP], mining, drought, population growth, alternative energy, climate change).

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ATTACHMENT 5 - Letter from 61 LANL Scientists & Engineers

October 5, 2017

Jamie Gonzales
Policy Division, New Mexico Public Education Department
Room 101, 300 Don Gaspar Avenue, Santa Fe, New Mexico 87501
rule.feedback@state.nm.us,

Regarding: 6.29.10 NMAC - New Mexico STEM-Ready Science Standards

Dear Public Education Department Officials:

We, the undersigned, are scientists and engineers concerned about New Mexico science education.

We strongly disagree with the proposed "New Mexico STEM-Ready Science Standards." These proposed standards fall far short of what is needed to foster scientifically literate students, compared to both the existing New Mexico science standards and the Next Generation Science Standards (NGSS) that are being adopted in many other states. In particular, we note that

- by changing occurrences of "global warming" in NGSS to "temperature fluctuations" in the proposed standards, and by many instances of sidelining climate change in some of the extra standards (tagged 'NM') that your department has added to NGSS, the proposed standards suggest denial of the reality of one of the central scientific and engineering challenges of our time: human-caused climate change,
- by striking the 4.6 billion year age of the Earth and the long co-evolution of planetary geology and the biosphere from the NGSS standards, the proposed standards eliminate important subjects, and might even be construed to allow teaching an alternative, non-scientific "young Earth" approach to Earth science and biology in science classes, and
- by eliminating some of the discussion of evolution from the NGSS, the proposed standards seem to suggest that there may be an alternative scientific explanation for the history of life on Earth and its current diversity, while in fact evolution is the only such scientific explanation, and is critical to progress in biomedical research.

Understanding the human causes of climate change, biological common ancestry and natural selection, and Earth's slow transformations are all essential to modern scientific literacy. There is absolutely no scientific rationale for weakening the treatment of these subjects in New Mexico K–12 education. Weak treatment of these subjects would be a disservice to our students and, ultimately, a blow to our state's economic competitiveness, adversely impacting the economy directly through diminished skills of the workforce, and indirectly through a tarnished state reputation that would discourage high-tech firms from locating here.

Sincerely,
Signatories below

Dr. Stephen A. Becker | Los Alamos National Laboratory Fellow.

Dr. Robert Benjamin | Los Alamos National Laboratory Fellow; Playwright; Children's science book author.

Dr. Donald Burton | Los Alamos National Laboratory Fellow.

Dr. Joe Carlson | Los Alamos National Laboratory Fellow; Fellow of American Physical Society; American Physical Society 2017 Herman Feshback Prize in Theoretical Nuclear Physics.

Dr. Bruce Carlsten | Fellow of American Physical Society; Fellow of Institute of Electrical and Electronics Engineers; Los Alamos National Laboratory Fellow.

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MY VIEW

Standing up for STEM-ready science

By Christopher Ruszkowski Oct 13, 2017

As an educator, it has always been clear to me how important rigorous academic standards and high-quality assessments are to guiding instruction in the classroom that truly drives student learning.

Because of this, I view the proposal of STEM-ready science standards as a pivotal moment for our state's education system. It is an opportunity to include critical thinking skills and engineering that have long been absent from our standards. It is an opportunity to generate real scientific inquiry among our scholars. It is an opportunity to integrate science into English, math and the arts — and vice versa. If you haven't yet compared our outdated standards to the new proposed standards, I encourage you to see for yourself just how significant these shifts are.

The major idea behind the proposal is simple: higher standards with increased flexibility. Teachers and families will continue to have flexibility and local control around materials, curriculum and content to develop and lead instruction that is in the best interest of their children's long-term success. Nothing in the state's proposal slows down leading-edge districts and charters that have already adopted next-generation materials and practices. Nothing in the state's proposal limits a school's flexibility in teaching above and beyond

what the standards require. Nothing in the state's proposal limits how local school boards or districts can incorporate community values. The standards are the starting point, certainly not the be-all, end-all.

It should also be noted that the proposed standards represent just one piece of a larger, student-centered STEM-readiness agenda for New Mexico. This includes adopting instructional materials next summer for the first time in seven years, incorporating STEM-readiness into School Grading to focus our energy there, expanding targeted investments for professional development and partnering with other states to build another world-class assessment. Taken together, this may be the most ambitious STEM-readiness agenda in the country — one that will drive improved student outcomes.

For those of you who see the bigger picture and have been thought partners, critical friends and insightful proponents of new standards — I thank you. By providing constructive feedback, you have grounded your efforts in the moral imperative of our state's education reform efforts. You recognize that our children don't often have strong advocates. I can tell that this is not a political issuefor you and I hope that others will join you in putting kids first.

Today, however, some claim to be seeking truth and social justice yet have consistently disparaged all other forms of measurement, data, accountability, evaluation and evidence on how to improve student outcomes, especially for our kids from low-income communities. For those taking that position or offering only misleading soundbites instead of taking constructive steps like scheduling a meeting or engaging in productive dialogue, let us not miss an opportunity to pull together and demonstrate a greater commitment to student success than public posturing.

As a former social studies teacher, no one appreciates more the democratic process of debate, discussion and deliberation — the ability of our citizenry to weigh in on the vital issues of our time. And as someone who has worked for governors on both sides of the aisle, I see this moment as another chance for collaboration, for us to come together to advance opportunities for all kids while demonstrating respect for the convictions of all New Mexicans.

I will continue to maintain my idealism about this. Listening to those with different viewpoints — and then reaching out and learning from them — will only help New Mexico's kids and our state's long-term future. That is what we will continue to do here at the Public Education Department to keep New Mexico on the rise, and that is the opportunity still on the table for those who are interested in improving our system and achieving measurable student success.

Christopher Ruszkowski is the secretary designate for the Public Education Department of New Mexico.

State Wires | New Mexico

New Mexico may restore evolution to science standards

By MORGAN LEE - 10/18/17 1:00 AM

SANTA FE, N.M. — New Mexico's public education secretary announced revisions will be made to proposed school science standards in response to a public outcry against the deletion or omission of references to global warming, evolution and the age of the Earth, in a statement released Tuesday.

Comments at a packed public hearing this week were overwhelmingly critical of state revisions to a set of standards developed by a consortium of states and the National Academy of Sciences.

The Public Education Department indicated that final standards will restore references to the 4.6 billion-year age of the Earth, the rise in global temperatures over the past century and the process of evolution due to genetic variation.

"We have listened to the thoughtful input received and will

incorporate many of the suggestions into the New Mexico standards," Public Education Secretary Christopher Ruszkowski said in a statement.

A complete version of the revised final standards is still being prepared and was not released.

Ruszkowski previously has defended the proposed standards as a way to give local families and teachers greater flexibility and local control around science materials, curriculum and content.

Major school districts, science teaching associations, leading scientists at a national weapons laboratory in New Mexico and others expressed fear that state revisions would short change students by leaving out fundamental components of earth sciences, global warming and genetics.

Scores of people at the public hearing urged the state to adopt an unedited version of Next Generation Science Standards.

Gregory Swift, a physicist at Los Alamos National Laboratory, said he was encouraged that the Public Education Department was redrafting the standards — though still cautious about the outcome.

"I'd like to see the whole set of changes," he said. "To me this looks like a politician's idea of a compromise by trying to give everybody something. But that's not a solid adherence to the science."

TAGS Atmospheric science Climate Climate change Climatology Earth science Education Education standards Environment Environment and nature Environmental concerns Government and politics Land environment Land management Land restoration and reclamation Math and science education Mexico government Natural resource management School curricula Science Social affairs

MORGAN LEE

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