2016 WYOMING SCIENCE

CONTENT AND PERFORMANCE STANDARDS

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2016 WYOMING SCIENCE CONTENT AND PERFORMANCE STANDARDS

INTRODUCTION

The Wyoming Science Content and Performance Standards (WyCPS) were last reviewed and approved in 2008 in accordance with Wyoming state statute W.S. 21-2-304(c). The 2016 Wyoming Content and Performance Standards were developed collaboratively through the contributions of Science Standard Review Committee (SSRC) members from across the state. The committee's work was informed and guided by initial public input through community forums, as well as input solicited from specific stakeholder groups.

INTRODUCTION TO STANDARDS

Content Standards: Content standards define what students are expected to know and be able to do by the time they graduate. They do not dictate what methodology or instructional materials should be used, nor how the material is delivered.

Benchmarks: Benchmarks (also called performance expectations in this document) specify what students are expected to know and be able to do at the end of each of the benchmark grade levels. These benchmarks specify the skills and content students must master along the way in order to demonstrate proficiency of the content standard by the time they graduate. In this standards document, you will find these are broken out into individual grades for Kindergarten through 5th grade and then banded by grade bands for middle school/junior high school and high school grade levels (6-8 and 9-12).

RATIONALE

Today, quality science education enables students to learn science by being actively involved with scientific and engineering practices as they progress from kindergarten through 12th grade. They are encouraged to be inquisitive, to actively explore their environment, and become productive, scientifically literate citizens. The standards we present here provide the necessary foundation for local school district decisions about curriculum, assessments, and instruction. Implementation of the new standards will better prepare Wyoming high school graduates for the rigors of college and/or careers. In turn, Wyoming employers will be able to hire workers with a strong science and engineering base — both in specific content areas and in critical thinking and inquiry-based problem solving.

The Wyoming Science Content and Performance Standards support that:

- all students can engage in sophisticated science and engineering practices.
- students must have the opportunity to conduct investigations, solve problems, and engage in discussions.
- students learn through relevant context and use modeling to explain observed phenomena.
- students move beyond facts and terminology to develop explanations and design solutions supported by evidence-based arguments and reasoning.
- students discuss open-ended questions that focus on the strength of the evidence used to generate claims.
- students develop summaries of information through multiple sources, including science-related magazine and journal articles and web-based resources.
- students develop questions that drive multiple investigations with a range of possible outcomes that collectively lead to a deep understanding of established core scientific ideas.
- students write reports, create posters, and design media presentations that explain and add credibility to their argument.
- students develop a better understanding of the science they are researching by accessing professional scientists and engineers through various means.
- students communicate and defend their research to an authentic audience such as at colloquiums with secondary students.

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ORGANIZATION OF STANDARDS

These standards were informed by *A Framework for K-12 Science Education* (National Research Council, 2012), the Next Generation Science Standards (National Academies Press, 2013), and the unique needs of Wyoming. They are distinct from prior science standards in that they integrate three dimensions of learning within each standard and have intentional connections across standards, grade bands, and subjects. The three dimensions are crosscutting concepts, disciplinary core ideas, and science and engineering practices.

Dimension 1: Crosscutting Concepts (CCC)
The seven crosscutting concepts have application across all domains of science. As such, they provide one way of linking across the domains of the Disciplinary Core Ideas.

Dimension 2: Disciplinary Core Ideas (DCI)
The continuing expansion of scientific knowledge makes it impossible to teach all of the ideas related to a given discipline in exhaustive detail during the K-12 years. But given the cornucopia of information available today, virtually at a touch, an important role of science education is not to teach "all the facts" but rather to prepare students in the four domains of science with sufficient core knowledge so that they can later acquire additional information on their own. The four domains referenced are: 1) physical science, 2) life science, 3) earth and space science, and 4) engineering, technology and applications of science.

Dimension 3: Science and Engineering Practices (SEP)
The SEPs describe (a) the major practices that scientists employ as they investigate and build models and theories about the world, and (b) a key set of engineering practices that engineers use as they design and build systems. We use the term "practices" instead of skills to emphasize that engaging in a scientific investigation requires not only skill but also knowledge that is specific to each practice.

Cross-curricular connections to Wyoming Content and Performance Standards in English Language Arts (ELA), Mathematics, Social Studies (S.S.), Physical Education (P.E.), Health, Fine and Performing Arts (FPA), and Career and Vocational Education (CVE) are identified and referenced within the science standards. These are intended as suggestions for areas where other content standards can be integrated in the teacher's instruction and lessons. The connection would be dependent on the curricula.

2016 Wyoming Science Standards

Physical Science	PS1 - Matter and Its Interactions							
	K	1	2	3	4	5	6-8	9-12
	PS2 - Motion and Stability: Forces and interactions							
	K	1	2	3	4	5	6-8	9-12
	PS3 - Energy							
	K	1	2	3	4	5	6-8	9-12
	PS4 - Waves and Their Applications in Technologies for Information Transfer							
	K	1	2	3	4	5	6-8	9-12
Life Science	LS1 - From Molecules to Organisms: Structure and Processes							
	K	1	2	3	4	5	6-8	9-12
	LS2 - Ecology: Interactions, Energy, and Dynamics							
	K	1	2	3	4	5	6-8	9-12
	LS3 - Heredity: Inheritance and Variation of Traits							
	K	1	2	3	4	5	6-8	9-12
	LS4 - Biological Evolution: Unity and Diversity							
	K	1	2	3	4	5	6-8	9-12
Earth & Space	ESS1 - Earth's Place in the Universe							
	K	1	2	3	4	5	6-8	9-12
	ESS2 - Earth's Systems							
	K	1	2	3	4	5	6-8	9-12
	ESS3 - Earth and Human Activity							
	K	1	2	3	4	5	6-8	9-12
ETS	ETS - Engineering, Technology, and Applications of Science							
	K	1	2	3	4	5	6-8	9-12

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On the next page you will find how to read this document and understand its many components.

WYOMING CROSS-CURRICULAR CONNECTIONS

At the bottom of each standards page, you will find where these science standards tie in with other content areas, such as the following:

- ELA
- Mathematics
- Social Studies
- Health
- Physical Education
- Career & Vocational Education
- Fine & Performing Arts

These standards can be found on the WDE website at http://edu.wyoming.gov/educators/standards

INTERNATIONAL SOCIETY FOR TECHNOLOGY IN EDUCATION (ISTE) CONNECTIONS

The Committee suggests educators use the following ISTE standards in their science curriculum, instruction, and activities, where appropriate. Standard 3 has been identified throughout the document, however others may apply depending on the curriculum used.

2007 ISTE Standards for Students

1. Creativity and innovation
2. Communication and collaboration
3. Research and information fluency
4. Critical thinking, problem solving, and decision making
5. Digital citizenship
6. Technology operations and concepts

RESOURCES / REFERENCES

National Research Council [NRC]. (2012). A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press.

NGSS Lead States (2013). *Next Generation Science Standards: For States, By States*. *Washington, DC: National Academies Press.*

National Research Council. (2015). *Guide to Implementing the Next Generation Science Standards* (pp. 8-9). Washington, DC: National Academies Press.

How to Read This Document

Earth's Place in the Universe [4-ESS1-1]

Grade Level

Performance Expectations (PE) are the benchmarks; the skills and content students should master.

Clarification Statements provide further explanation or examples to support educators.

The State Assessment Boundary is to be considered when developing classroom and district assessments and gives limitations to the state assessment.

Symbol denotes WY examples are given or can be considered in instruction

Science Standard

Code [4.ESS1-1] means Grade 4, Earth & Space Science, Standard 1, Benchmark 1

Crosscutting Concepts (CCC) represent themes that span across engineering and science disciplines.

Disciplinary Core Ideas (DCI) represent a set of ideas for K-12 science education.

Science & Engineering Practices (SEP) will help students develop problem solving skills and understand their world through investigation.

Wyoming Cross-Curricular Connections identify possible connections to other WY Content & Performance Standards. These are intended to be suggestions and may be relevant depending on curriculum and instruction.

4th Performance Expectations (Benchmark)	Three Dimensions of Learning	
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. Clarification Statement: Examples of evidence from patterns (may include, but not limited to, Wyoming specific examples) could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom indicating that over time a river cut through the rock. State Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.	**Crosscutting Concepts**	**Patterns can be used as evidence to support an explanation.**
	Disciplinary Core Ideas	**The History of Planet Earth:** • Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. • The presence and location of certain fossil types indicate the order in which rock layers were formed.
	Science & Engineering Practices	**Constructing explanations and designing solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.** • Identify the evidence that supports particular points in an explanation.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections	Social Studies Connections	Mathematics Connections
W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. **W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. **W.4.9** Draw evidence from literary or informational texts to support analysis, reflection, and research.	**SS5.5.2** Explain how physical features, patterns, and systems impact different regions and how these features may help us generalize and compare areas within the state, nation, or world.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **4.MD.A.1** Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.

2016 WYOMING SCIENCE CONTENT AND PERFORMANCE STANDARDS
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Elementary Standards

Students in kindergarten through fifth grade begin to develop an understanding of the four disciplinary core ideas: physical sciences; life sciences; earth and space sciences; and engineering, technology, and applications of science. In the earlier grades, students begin by recognizing patterns and formulating answers to questions about the world around them. By the end of fifth grade, students are able to demonstrate grade-appropriate proficiency in gathering, describing, and using information about the natural and designed world(s). The performance expectations in elementary school grade bands develop ideas and skills that will allow students to explain increasingly complex phenomena in the four disciplines as they progress to middle school and high school. The performance expectations shown in kindergarten through fifth grade couple particular practices and crosscutting concepts with specific disciplinary core ideas. However, instructional decisions should include use of additional practices and crosscutting concepts that lead to the performance expectations.

Third Grade

Third grade performance expectations include PS2, LS1, LS2, LS3, LS4, ESS2, and ESS3 Disciplinary Core Ideas adapted from the NRC Framework. The performance expectations in third grade help students formulate answers to questions such as: "What is typical weather in different parts of the world and during different times of the year? How can the impact of weather-related hazards be reduced? How do organisms vary in their traits? How are plants, animals, and environments of the past similar or different from current plants, animals, and environments? What happens to organisms when their environment changes? How do equal and unequal forces on an object affect the object? How can magnets be used?" Students are able to organize and use data to describe typical weather conditions expected during a particular season. By applying their understanding of weather-related hazards, students are able to make a claim about the merit of a design solution that reduces the impacts of such hazards. Students are expected to develop an understanding of the similarities and differences of organisms' life cycles. An understanding that organisms have different inherited traits, and that the environment can also affect the traits that an organism develops, is acquired by students at this level. In addition, students are able to construct an explanation using evidence for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. Students are expected to develop an understanding of types of organisms that lived long ago and also about the nature of their environments. Third graders are expected to develop an understanding of the idea that when the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die. Students are able to determine the effects of balanced and unbalanced forces on the motion of an object and the cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. They are then able to apply their understanding of magnetic interactions to define a simple design problem that can be solved with magnets.

The Crosscutting Concepts and Connections to Engineering, Technology, and Applications of Science, listed below, are the organizing concepts for these Disciplinary Core Ideas.

Crosscutting Concepts

- Patterns
- Cause and effect
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter
- Structure and function
- Stability and change

Connections to Engineering, Technology, and Applications of Science

- Interdependence of science, engineering, and technology
- Influence of science, engineering, and technology on society and the natural world

In the third grade performance expectations, students are expected to demonstrate understanding of the core ideas and grade appropriate proficiency in using the Science and Engineering Practices below:

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Motion and Stability: Forces and Interactions [3-PS2-1]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
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. Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all. State Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.	**Crosscutting Concepts**	**Cause and effect relationships are routinely identified.**
	Disciplinary Core Ideas	**Forces and Motion:** • Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) **Types of Interactions:** • Objects in contact exert forces on each other.
	Science & Engineering Practices	**Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.** • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections	Mathematics Connections
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **W.3.7** Conduct short research projects that build knowledge about a topic. **W.3.8** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.	**MP.2** Reason abstractly and quantitatively. **MP.5** Use appropriate tools strategically. **3.MD.A.2** Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

Motion and Stability: Forces and Interactions [3-PS2-2]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
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. Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw. State Assessment Boundary: Assessment does not include technical terms such as period and frequency.	**Crosscutting Concepts**	**Patterns of change can be used to make predictions.**
	Disciplinary Core Ideas	**Forces and Motion:** • The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.)
	Science & Engineering Practices	**Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.** • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections		Mathematics Connections
W.3.7 Conduct short research projects that build knowledge about a topic. **W.3.8** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.		**N/A**

Motion and Stability: Forces and Interactions [3-PS2-3]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
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. Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force. State Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.	**Crosscutting Concepts**	**Cause and effect relationships are routinely identified, tested, and used to explain change.**
	Disciplinary Core Ideas	**Types of Interactions:** • Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.
	Science & Engineering Practices	**Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.** • Ask questions that can be investigated based on patterns such as cause and effect relationships.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections		Mathematics Connections
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **RI.3.8** Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence). **SL.3.3** Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.		**N/A**

Motion and Stability: Forces and Interactions [3-PS2-4]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
3-PS2-4. Define a simple design problem that can be solved by applying scientific ideas about magnets. Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other. Engineering, Technology & Application of Science Connections 3-5-ETS1-1 (pg. 66) 3-5-ETS1-2 (pg. 67)	**Crosscutting Concepts**	**Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.**
	Disciplinary Core Ideas	**Types of Interactions:** • Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. **Interdependence of Science, Engineering, and Technology:** • Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.
	Science & Engineering Practices	**Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.** • Define a simple problem that can be solved through the development of a new or improved object or tool.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections		Mathematics Connections
N/A		**N/A**

From Molecules to Organisms: Structures & Processes [3-LS1-1]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
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. Clarification Statement: Changes organisms go through during their life form a pattern. State Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.	**Crosscutting Concepts**	**Patterns of change can be used to make predictions.**
	Disciplinary Core Ideas	**Growth and Development of Organisms:** • Reproduction is essential to the continued existence of every kind of organism. • Plants and animals have unique and diverse life cycles.
	Science & Engineering Practices	**Developing and using models in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.** • Develop models to describe phenomena.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections		Mathematics Connections
RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). **SL.3.5** Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details.		**MP.4** Model with mathematics. **3.NBT** Number and Operations in Base Ten **3.NF** Number and Operations—Fractions

Ecosystems: Interactions, Energy, and Dynamics [3-LS2-1]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
3-LS2-1. Construct an argument that some animals form groups that help members survive. State Assessment Boundary: Use WY animals as examples.	**Crosscutting Concepts**	**Cause and effect relationships are routinely identified and used to explain change.**
	Disciplinary Core Ideas	**Social Interactions and Group Behavior:** • Being part of a group helps animals obtain food, defend themselves, and cope with changes. • Groups may serve different functions and vary dramatically in size.
	Science & Engineering Practices	**Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).** • Construct an argument with evidence, data, and/or a model.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections		Mathematics Connections
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.1** Write opinion pieces on topics or texts, supporting a point of view with reasons.		**MP.4** Model with mathematics. **3.NBT** Number and Operations in Base Ten

Heredity: Inheritance and Variation of Traits [3-LS3-1]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
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. Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans. State Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.	**Crosscutting Concepts**	**Similarities and differences in patterns can be used to sort and classify natural phenomena.**
	Disciplinary Core Ideas	**Inheritance of Traits:** • Many characteristics of organisms are inherited from their parents. **Variation of Traits:** • Different organisms vary in how they look and function because they have different inherited information.
	Science & Engineering Practices	**Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.** • Analyze and interpret data to make sense of phenomena using logical reasoning.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections	Mathematics Connections
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **3.MD.B.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

Heredity: Inheritance and Variation of Traits [3-LS3-2]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
3-LS3-2. Use evidence to support the explanation that observable traits can be influenced by the environment. Clarification Statement: Environmental factors that vary for organisms of the same type (e.g., amount of food, amount of water, and amount of exercise an animal gets, chemicals in the water) may influence organisms' observable traits.	**Crosscutting Concepts**	**Cause and effect relationships are routinely identified and used to explain change.**
	Disciplinary Core Ideas	**Inheritance of Traits:** • Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. **Variation of Traits:** • The environment also affects the traits that an organism develops.
	Science & Engineering Practices	**Constructing explanations (for science) and designing solutions (for engineering) in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.** • Use evidence (e.g., observations, patterns) to support an explanation.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections	Mathematics Connections
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **3.MD.B.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

Biological Evolution: Unity and Diversity [3-LS4-1]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms. State Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.	**Crosscutting Concepts**	**Observable phenomena exist from very short to very long time periods.**
	Disciplinary Core Ideas	**Evidence of Common Ancestry and Diversity:** • Some kinds of plants and animals that once lived on Earth are no longer found anywhere. • Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.
	Science & Engineering Practices	**Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.** • Analyze and interpret data to make sense of phenomena using logical reasoning.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections		Mathematics Connections
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.1** Write opinion pieces on topics or texts, supporting a point of view with reasons. **W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **W.3.9** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.		**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **3.MD.B.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

Biological Evolution: Unity and Diversity [3-LS4-2]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
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. Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.	**Crosscutting Concepts**	**Observable phenomena exist from very short to very long time periods.**
	Disciplinary Core Ideas	**Natural Selection:** • Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.
	Science & Engineering Practices	**Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.** • Use evidence (e.g., observations, patterns) to construct an explanation.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections		Mathematics Connections
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.		**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **3.MD.B.3** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.

Biological Evolution: Unity and Diversity [3-LS4-3]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
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. Clarification Statement: Examples of evidence could include needs and traits of the organisms and characteristics of the habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.	**Crosscutting Concepts**	**Cause and effect relationships are routinely identified and used to explain change.**
	Disciplinary Core Ideas	**Adaptation:** • For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.
	Science & Engineering Practices	**Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).** • Construct an argument with evidence.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections	Social Studies Connections	Mathematics Connections
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.1** Write opinion pieces on topics or texts, supporting a point of view with reasons. **W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.	**SS5.5.4** Describe how the environment influences people in Wyoming and how we adjust to and/or change our environment in order to survive (e.g., natural resources, housing, and food).	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **3.MD.B.3** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and twostep "how many more" and "how many less" problems using information presented in scaled bar graphs.

Biological Evolution: Unity and Diversity [3-LS4-4]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
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. Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms. State Assessment Boundary: Assessment is limited to a single environmental change. Engineering, Technology & Application of Science Connections 3-5-ETS1-1 (pg. 66) 3-5-ETS1-2 (pg. 67)	**Crosscutting Concepts**	**A system can be described in terms of its components and their interactions.**
	Disciplinary Core Ideas	**Ecosystem Dynamics, Functioning, and Resilience:** • When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. **Biodiversity and Humans:** • Populations live in a variety of habitats, and change in those habitats affects the organisms living there.
	Science & Engineering Practices	**Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).** • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections	Social Studies Connections	Mathematics Connections
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.1** Write opinion pieces on topics or texts, supporting a point of view with reasons. **W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.	**SS5.5.4** Describe how the environment influences people in Wyoming and how we adjust to and/or change our environment in order to survive (e.g., natural resources, housing, and food).	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

Earth's Systems [3-ESS2-1]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction. State Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.	**Crosscutting Concepts**	**Patterns of change can be used to make predictions.**
	Disciplinary Core Ideas	**Weather and Climate:** • Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.
	Science & Engineering Practices	**Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.** • Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections		Mathematics Connections
N/A		**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **3.MD.A.2** Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. **3.MD.B.3** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in bar graphs.

Earth's Systems [3-ESS2-2]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
3-ESS2-2. Obtain and combine information to describe climates in different regions of the world.	**Crosscutting Concepts**	**Patterns of change can be used to make predictions.**
	Disciplinary Core Ideas	**Weather and Climate:** • Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.
	Science & Engineering Practices	**Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.** • Obtain and combine information from books and other reliable media to explain phenomena.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections		Mathematics Connections
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.9** Compare and contrast the most important points and key details presented in two texts on the same topic. **W.3.9** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.		**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

Earth and Human Activity [3-ESS3-1]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods. Engineering, Technology & Application of Science Connections 3-5-ETS1-1 (pg. 66) 3-5-ETS1-2 (pg. 67)	**Crosscutting Concepts**	**Cause and effect relationships are routinely identified, tested, and used to explain change.**
	Disciplinary Core Ideas	**Natural Hazards:** • A variety of natural hazards result from natural processes. • Humans cannot eliminate natural hazards but can take steps to reduce their impacts. Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2. **Influence of Engineering, Technology, and Science on Society and the Natural World:** Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones).
	Science & Engineering Practices	**Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).** • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections	Social Studies Connections	Mathematics Connections
W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. **W.3.7** Conduct short research projects that build knowledge about a topic.	**SS5.6.2** Identify validity of information (e.g., accuracy, relevancy, fact, or fiction).	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

Engineering, Technology, & Applications of Science [3-5-ETS1-1]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
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. Science Standards Connections 3-PS2-4 (pg. 54) 3-LS4-4 (pg. 62) 3-ESS3-1 (pg.65)	**Crosscutting Concepts**	**People's needs and wants change over time, as do their demands for new and improved technologies.**
	Disciplinary Core Ideas	**Defining and Delimiting Engineering Problems:** • Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be prepared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.
	Science & Engineering Practices	**Asking questions and Defining Problems in 3-5 builds on grades K-2 experiences and progresses to specifying qualitative relationships.** • Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections	Social Studies Connections	Mathematics Connections
N/A	**SS.5.4.2** Describe how tools and technology makes life easier; describe how one tool or technology evolves into another (e.g., telegraph to telephone to cell phone or horse-drawn wagon to railroad to car); identify a tool or technology that impacted history (e.g., ships allowed for discovery of new lands or boiling water prevented spread of disease). **SS5.6.2** Distinguish between fiction and non-fiction.	**N/A**

Engineering, Technology, & Applications of Science [3-5-ETS1-2]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
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. Science Standards Connections 3-PS2-4 (pg. 54) 3-LS4-4 (pg. 62) 3-ESS3-1 (pg. 65)	**Crosscutting Concepts**	**Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.**
	Disciplinary Core Ideas	**Developing Possible Solutions:** • Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. • At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.
	Science & Engineering Practices	**Constructing Explanations and Designing Solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.** • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections	Social Studies Connections	Mathematics Connections
N/A	**SS5.6.2** Distinguish between fiction and non-fiction.	**N/A**

Engineering, Technology, & Applications of Science [3-5-ETS1-3]

3rd

Performance Expectations (Benchmark)	Three Dimensions of Learning	
3-5-ETS1-3. 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.	**Crosscutting Concepts**	*Intentionally Left Blank*
	Disciplinary Core Ideas	**Developing Possible Solutions:** • Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. **Optimizing the Design Solution:** • Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.
	Science & Engineering Practices	**Planning and Carrying Out Investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.** • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.

Wyoming Cross-Curricular Connections

ELA / Literacy Connections	Social Studies Connections	Mathematics Connections
N/A	**SS5.6.2** Distinguish between fiction and non-fiction.	**N/A**

Appendices/Resources that are available include:

- **Appendix A - A Model of the Three Dimensions of Science Learning**
- **Appendix B - Three Dimensions of Learning Framework**
- **Appendix C - ISTE Standards (International Society of Technology in Education)**
- **Appendix D - Connections to the Literacy Standards, ELA, and Mathematics Standards**
- **Appendix E - Disciplinary Core Ideas**
- **Appendix F - Science & Engineering Practices**
- **Appendix G - Crosscutting Concepts**
- **Appendix H - Nature of Science**
- **Appendix I - Engineering, Technology, and Applications of Science**
- **Appendix J - Glossary**
- **Appendix K - Acronyms**

These and other resources can be found at
https://edu.wyoming.gov/educators/standards/science