DoDEA College and Career Ready Standards for Science
Integrated Science I

COLLEGE AND CAREER READY
A WORLD-CLASS EDUCATION FOR MILITARY-CONNECTED STUDENTS

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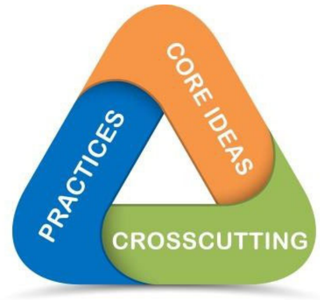
DEPARTMENT OF DEFENSE EDUCATION ACTIVITY

Three Dimensional Learning

The National Research Council's (NRC) *A Framework for K-12 Science Education* describes a vision of what it means to be proficient in science; it rests on a view of science as both a body of knowledge and an evidence-based, model and theory building enterprise that continually extends, refines, and revises knowledge. It presents the following three dimensions: practices, crosscutting concepts, and disciplinary core ideas (DCIs) that will be combined to form each standard:

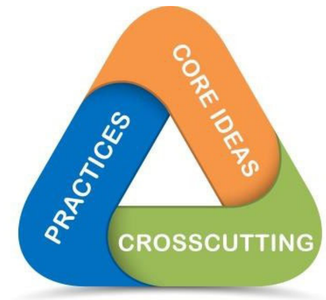


DIMENSION 1: PRACTICES	The practices describe behaviors that scientists engage in as they investigate and build models and theories about the natural world and the key set of engineering practices that engineers use as they design and build models and systems. The NRC uses the term practices instead of a term like "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. Part of the NRC's intent is to better explain and extend what is meant by "inquiry" in science and the range of cognitive, social, and physical practices that it requires. Although engineering design is similar to scientific inquiry, there are significant differences. For example, scientific inquiry involves the formulation of a question that can be answered through investigation, while engineering design involves the formulation of a problem that can be solved through design. Strengthening the engineering aspects of the Next Generation Science Standards will clarify for students the relevance of science, technology, engineering and mathematics (the four STEM fields) to everyday life.
DIMENSION 2: CROSSCUTTING CONCEPTS	Crosscutting concepts have application across all domains of science. As such, they are a way of linking the different domains of science. They include: Patterns; Cause and Effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change. The NRC Framework emphasizes that these concepts need to be made explicit for students because they provide an organizational schema for interrelating knowledge from various science fields into a coherent and scientifically-based view of the world.
DIMENSION 3: DISCIPLINARY CORE IDEAS (DCIs)	Disciplinary core ideas have the power to focus K–12 science curriculum, instruction and assessments on the most important aspects of science. To be considered core, the ideas should meet at least two of the following criteria and ideally all four: ▪ Have broad importance across multiple sciences or engineering disciplines or be a key organizing concept of a single discipline; ▪ Provide a key tool for understanding or investigating more complex ideas and solving problems; ▪ Relate to the interests and life experiences of students or be connected to societal or personal concerns that require scientific or technological knowledge; ▪ Be teachable and learnable over multiple grades at increasing levels of depth and sophistication. Disciplinary ideas are grouped in four domains: the physical sciences; the life sciences; the earth and space sciences; and engineering, technology and applications of science.

How To Read The Standards

Performance Expectation

The DoDEA College and Career Ready Standards for Science (CCRSS) are written as a set of performance expectations that are assessable statements of what students should know and be able to do. An underlying assumption of these standards is that all students should be held accountable for demonstrating their achievement of all performance expectations. A coherent and complete view of what students should be able to do comes when the performance expectations are viewed in tandem with the contents of the foundation boxes that lie just below the performance expectations. These three boxes include the practices, disciplinary core ideas, and crosscutting concepts, derived from the National Research Council's Framework for K12 Science Education that were used to construct this set of performance expectations.



Science and Engineering Practices (SEPs)	Disciplinary Core Ideas (DCIs)	Crosscutting Concepts (CCCs)
The blue box on the left includes the science and engineering practices used to construct the performance expectations in the box above. These statements are derived from and grouped by the eight categories detailed in the NRC Framework to further explain the science and engineering practices important to emphasize in each grade band. Most sets of performance expectations emphasize only a few of the practice categories; however, all practices are emphasized within a grade band.	The orange box in the middle includes statements that are taken from the NRC Framework about the most essential ideas in the major science disciplines that all students should understand during 13 years of school. Including these detailed statements was very helpful to the writing team as they analyzed and "unpacked" the disciplinary core ideas and sub-ideas to reach a level that is helpful in describing what each student should understand about each sub-idea at the end of grades 2, 5, 8, and 12. Although they appear in paragraph form in the NRC Framework, here they are bulleted to be certain that each statement is distinct.	The green box on the right includes statements derived from the NRC Framework's list of crosscutting concepts, which apply to one or more of the performance expectations in the box above. Most sets of performance expectations limit the number of crosscutting concepts so as focus on those that are readily apparent when considering the DCIs; however, all are emphasized within a grade band. Aspects of the Nature of Science relevant to the standard are also listed in this box, as are the interdependence of science and engineering, and the influence of engineering, technology, and science on society and the natural world.

CONNECTION BOXES

Three Connection Boxes are designed to support a coherent vision of the standards by showing how the performance expectations in each standard connect to other performance expectations in science, as well as to the DoDEA College and Career Ready Standards for English/Language Arts (CCRSL) and Mathematics (CCRSM).

The three boxes include:

Connections to other DCIs in this grade level or band. This box contains the names of science topics in other disciplines that have related disciplinary core ideas at the same grade level. For example, both Physical Science and Life Science performance expectations contain core ideas related to photosynthesis, and could be taught in relation to one another

Articulation of DCIs across grade levels. This box contains the names of other science topics that either:
1) provide a foundation for student understanding of the core ideas in this set of performance expectations (usually at prior grade levels) or
2) build on the foundation provided by the core ideas in this set of performance expectations (usually at subsequent grade levels).

DoDEA College and Career Ready Standards
This box contains the connections to ELA/Literacy (CCRSL) and Mathematics (CCRSM) as shown below.

ELA/Literacy (CCRSL) Connections	
SCIENCE	ELA/LITERACY
Performance Expectation	Standard Connection

Mathematics (CCRSM) Connections	
SCIENCE	MATHEMATICS
Performance Expectation	Standard Connection

Integrated Science I Storyline:

Module A Engineering and Science

Unit 1 Introduction to Engineering and Science

In Module A, Unit 1, you will begin exploring the relationship between engineering and science and how each is related to technology and to the society in which we live. As you work on Unit 1, you will describe systems and use system models to study the world around you and the way matter cycles and energy flows within and between systems. Later in Unit 1, you will use the engineering design process to find solutions to problems, and you will consider the similarities and differences between the practices of engineering and science. In Unit 1, you will explore questions such as

- How does technology affect society and the environment?
- How are science, engineering, and technology related?
- How can the idea of systems be used to understand and study the world?
- How are new products and processes developed?
- How is the work of scientists and engineers related?

Unit 2 The Practices of Engineering

In Unit 2, you will build on the Unit 1 introduction to the engineering design process and explore each part of that process in more detail. As you work on Unit 2, you will also use the engineering design process to define and research problems, develop and test solutions, and optimize solutions. In Unit 2, you will explore questions such as

- What is the best way to define a problem so that a good solution can be found?
- How can the most promising possible solutions be chosen for testing?
- How can solutions be improved by changing the design based on test results?

Integrated Science I Storyline Continued:

Module E Earth's Water and Atmosphere

Unit 1 Circulation of Earth's Air and Water

In Module E, Unit 1, you will analyze the movements of air in the atmosphere and water in Earth's oceans. You will apply the concept of systems that was introduced in Module A to look at various parts of the Earth system and at the Earth system as a whole. You will also analyze the water cycle and how it involves the cycling of matter and the flow of energy. In Unit 1, you will explore questions such as

- What causes wind to blow and ocean currents to flow?
- How are the movements of water and air related to the flow of energy and the cycling of matter in the atmosphere and the oceans?
- How and why does water change and move in the Earth system?

Unit 2 Weather and Climate

You will investigate weather in Unit 2, using what you learned in Unit 1 about the water cycle and the movement of matter and energy in Earth's atmosphere and oceans to help explain the factors that influence weather. You will analyze how models can be used to forecast weather conditions. Later in Unit 2, you will investigate factors that influence climate, which describes average weather conditions in an area over a long period of time. In Unit 2, you will explore questions such as

- How do the cycling of matter and the flow of energy in the Earth system influence weather?
- How can models be used to predict weather, and how accurate can those predictions be?
- How can we explain the different climates in different regions of Earth?
- What are the main climate zones in the Earth system?

Integrated Science I Storyline Continued:

Module D The Diversity of Living Things

Unit 1 The History of Life on Earth

In Module D, Unit 1, you will continue your exploration of Earth systems as you study the fossil record and how the geologic time scale is used to organize Earth's history. As you work on Unit 1, you will also explore evidence for the common ancestry of related species. This work will lead into the study of evolution in Unit 2. In Unit 1, you will explore questions such as

- How do changes in matter lead to the formation of fossils?
- What do changes and patterns in the fossil record tell us about the history of life on Earth?
- What evidence supports explanations of how populations evolve over time?

Unit 2 Evolution

In Unit 2, you will explore how the patterns in genetic material in cells influence traits in organisms. You will model natural selection in a population and relate natural selection and the flow of genetic information between generations to evolution. This helps explain how the changes you studied in Unit 1 have happened throughout Earth's history. You will also examine evidence about speciation and extinction in the history of life on Earth and examine how human activity can cause extinctions. In Unit 2, you will explore questions such as

- What causes genetic changes?
- How are genetic changes related to adaptations in organisms and populations?
- How can the environment in which a population lives determine which traits are beneficial and which are not?
- How do species change, and how do new species form?
- Why have some species become extinct?

Unit 3 Human Influence on Inheritance

In Unit 3, you will continue the exploration of genetic change that you began in Unit 2. You will analyze how humans influence changes in species by selecting for traits that humans want. As you work on Unit 3, you will study how artificial selection can be used to solve problems or meet human needs and how this relates to the cycling of matter and the flow of energy in the Earth system. You will finish Unit 3 by exploring the differences between artificial selection and genetic engineering and by considering case studies involving genetically modified organisms. In Unit 3, you will explore questions such as

- What is the genetic basis for artificial selection?
- How have humans used artificial selection?
- How are artificial selection and genetic engineering the same? How are they different?
- How is gene therapy use to treat or prevent certain diseases?

Integrated Science I Storyline Continued:

Module K Forces, Motion, and Fields

Unit 1 Forces and Motion

In Module K, Unit 1, you will continue your study of matter and energy in the Earth system as you analyze how forces are related to matter in the Earth system and beyond, in our solar system. As you work on Unit 1, you will analyze how gravity and friction affect the movement of matter and how Newton's laws of motion describe the ways unbalanced forces cause changes in motion. You will end Unit 1 with a study of collisions and apply the engineering design process to a problem about collisions of matter. In Unit 1, you will explore questions such as

- How do forces act on objects?
- How do gravity, friction, and air resistance influence objects in motion?
- How can we describe and measure motion?
- How do Newton's Laws of motion describe and predict patterns we see in the motion of matter?
- How are energy and collisions related?

Unit 2 Electric and Magnetic Forces

In Unit 2, you will continue the exploration of forces you began in Unit 1 by analyzing magnetic and electric forces. You will also continue your study of gravity as you explore gravitational, electric, and magnetic fields. You will end Unit 2 with an analysis of electromagnetism as you explore the interaction between electric and magnetic phenomena. In Unit 2, you will explore questions such as

- What variables influence the strength of a magnetic force?
- What variables influence the strength of an electric force?
- How can fields be modeled if we cannot see them?
- How are an electric current and a magnetic field related?

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MS-ETS1 Engineering Design

MS-ETS1 Engineering Design

Students who demonstrate understanding can:

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.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

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.

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.

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models. ▪ Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1) **Developing and Using Models** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. ▪ Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)	**ETS1.A: Defining and Delimiting Engineering Problems** ▪ The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1) ETS1.B: **Developing Possible Solutions** ▪ A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) ▪ There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3) ▪ Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) ▪ Models of all kinds are important for testing solutions. (MS-ETS1-4)	**Influence of Science, Engineering, and Technology on Society and the Natural World** ▪ All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1) ▪ The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. ▪ Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3) **Engaging in Argument from Evidence** Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world. ▪ Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)	**ETS1.C: Optimizing the Design Solution** ▪ Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3) ▪ The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MSETS1-4)	

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea. The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas.

Connections

CONNECTIONS
Connections to MS-ETS1.A: Defining and Delimiting Engineering Problems include: **Physical Science:** MS-PS3-3 Connections to MS-ETS1.B: Developing Possible Solutions Problems include: **Physical Science:** MS-PS1-6, MS-PS3-3, **Life Science:** MS-LS2-5 Connections to MS-ETS1.C: Optimizing the Design Solution include: **Physical Science:** MS-PS1-6
Articulation of DCIs across grade-bands: 3-5.ETS1.A (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3); 3-5.ETS1.B (MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); 3-5.ETS1.C (MS-ETS1-1),(MSETS1-2),(MS-ETS1-3),(MS-ETS1-4); HS.ETS1.A (MS-ETS1-1),(MS-ETS1-2); HS.ETS1.B (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); HS.ETS1.C (MS-ETS1-3),(MS-ETS1-4)

DODEA COLLEGE AND CAREER READY STANDARDS

ELA/Literacy (CCRSL) Connections	
SCIENCE	ELA/LITERACY
(MS-ETS1-1) (MS-ETS1-2) (MS-ETS1-3)	**RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions
(MS-ETS1-3)	**RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
(MS-ETS1-2) (MS-ETS1-3)	**RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
(MS-ETS1-2)	**WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
(MS-ETS1-1)	**WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
(MS-ETS1-2)	**WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research.
(MS-ESS1-4)	**SL8.5** Integrate_multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Connections

DODEA COLLEGE AND CAREER READY STANDARDS

Mathematics (CCRSM) Connections	
SCIENCE	MATHEMATICS
(MS-ETS1-1) (MS-ETS1-2) (MS-ETS1-3) (MS-ETS1-4)	**MP.2** Reason abstractly and quantitatively.
(MS-ETS1-1) (MS-ETS1-2) (MS-ETS1-3)	**7.EE.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
(MS-ETS1-4)	**7.SP** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

MS-ESS2 Earth's Systems

MS-ESS2 Earth's Systems

Students who demonstrate understanding can:

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.
[Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
[Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).] [Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.]

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.
[Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] [Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.]

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. ▪ Develop and use a model to describe phenomena. (MS-ESS2-6) ▪ Develop a model to describe unobservable mechanisms. (MS-ESS2-4)	**ESS2.C: The Roles of Water in Earth's Surface Processes** ▪ Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4)	**Cause and Effect** ▪ Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MSESS2-5) **Systems and System Models** ▪ Models can be used to represent systems and their interactions—such as inputs, processes and outputs— and energy, matter, and information flows within systems. (MS-ESS2-6) **Energy and Matter** ▪ Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions. ▪ Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-ESS2-5)	▪ The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MSESS2-5) ▪ Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4) ▪ Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6) **ESS2.D: Weather and Climate** ▪ Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6) ▪ Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5) ▪ The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)	

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Connections

CONNECTIONS
Connections to other DCIs in this grade-band: MS.PS1.A (MS-ESS2-4), (MS-ESS2-5); MS.PS2.A (MS-ESS2-5), (MS-ESS2-6); MS.PS2.B (MS-ESS2-4); MS.PS3.A (MS-ESS2-4), (MS-ESS2-5); MS.PS3.B (MS-ESS2-5), (MS-ESS2-6); MS.PS3.D (MS-ESS2-4); MS.PS4.B (MS-ESS2-6);
Articulation across grade-bands: 3.PS2.A (MS-ESS2-4),(MS-ESS2-6); 3.ESS2.D (MS-ESS2-5), (MS-ESS2-6); 4.PS3.B MS-ESS2-4); 5.PS2.B (MSESS2-4); 5.ESS2.A MS-ESS2-5), (MS-ESS2-6); 5.ESS2.C (MS-ESS2-4); HS.PS2.B (MS-ESS2-4), (MS-ESS2-6); HS.PS3.B (MS-ESS2-4), (MS-ESS2-6); MS-ESS2-6); HS.PS4.B (MS-ESS2-4); HS.ESS1.B (MS-ESS2-6); HS.ESS2.A (MS-ESS2-4), (MS-ESS2-6); HS.ESS2.C (MS-ESS2-4), (MS-ESS2-5); HS.ESS2.D (MS-ESS2-4), (MS-ESS2-5), (MS-ESS2-6);

DODEA COLLEGE AND CAREER READY STANDARDS

ELA/Literacy (CCRSL) Connections

SCIENCE	ELA/LITERACY
(MS-ESS2-4)	**RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions
(MS-ESS2-5)	**RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
(MS-ESS2-6)	**WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
(MS-ESS2-5)	**WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
(MS-ESS2-6)	**SL8.5** Integrate_multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Mathematics (CCRSM) Connections

SCIENCE	MATHEMATICS
(MS-ESS2-5)	**MP.2** Reason abstractly and quantitatively.
(MS-ESS2-5)	**6.NS.C.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation

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MS-LS3 Heredity: Inheritance and Variation of Traits

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Students who demonstrate understanding can:

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.
[Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific ty pes of mutations.]

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to dev eloping, using, and revising models to describe, test, and predict more abstract phenomena and design systems. ▪ Develop and use a model to describe phenomena. (MS-LS3-1),	**LS3.A: Inheritance of Traits** ▪ Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1) **LS3.B: Variation of Traits** ▪ In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)	**Structure and Function** ▪ Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)

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Connections

CONNECTIONS
Connections to other DCIs in this grade-band: MS.LS1.A (MS-LS3-1); MS.LS4.A (MS-LS3-1)
Articulation across grade-bands: 3.LS3.A (MS-LS3-1); 3.LS3.B (MS-LS3-1); HS.LS1.A (MS-LS3-1); HS.LS1.B (MS-LS3-1); HS.LS3.A (MS-LS3- 1); HS.LS3-B (MS-LS3-1)

DODEA COLLEGE AND CAREER READY STANDARDS

ELA/Literacy (CCRSL) Connections	
SCIENCE	ELA/LITERACY
(MS-LS3-1)	**RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions
(MS-LS3-1)	**RST.6-8.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
(MS-LS3-1)	**RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
(MS-LS3-1)	**SL8.5** Integrate_multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Mathematics (CCRSM) Connections	
SCIENCE	MATHEMATICS

MS-LS4 Biological Evolution: Unity and Diversity

MS-LS4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

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.
[Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]

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.
[Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]

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.
[Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]

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.
[Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

MS-LS4-5. Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.
[Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]

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.
[Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.	**LS4.A: Evidence of Common Ancestry and Diversity** ▪ The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)	**Patterns** ▪ Patterns can be used to identify cause and effect relationships. (MS-LS4-2) ▪ Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1),(MS-LS4- 3) Cause an

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Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
▪ Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3) ▪ Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1) **Using Mathematics and Computational Thinking** Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments. ▪ Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. ▪ Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. (MS-LS4-2) ▪ Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4) **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.	▪ Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2) ▪ Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3) **LS4.B: Natural Selection** ▪ Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4) ▪ In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5) **LS4.C: Adaptation** ▪ Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)	**Cause and Effect** ▪ Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-5),(MS-LS4-6) - ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** ▪ Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5) - **Connections to Nature of Science** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** ▪ Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1),(MS-LS4-2) **Science Addresses Questions About the Natural and Material World** ▪ Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS4-5)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea. The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas.

Connections

CONNECTIONS
Connections to other DCIs in this grade-band: MS.LS2.A (MS-LS4-4),(MS-LS4-6); MS.LS2.C (MS-LS4-6); MS.LS3.A (MS-LS4-2),(MS-LS4-4); MS.LS3.B (MS-LS4-2),(MS-LS4-4),(MSLS4-6); MS.ESS1.C (MS-LS4-1),(MS-LS4-2),(MS-LS4-6); MS.ESS2.B (MS-LS4-1)
Articulation across grade-bands: 3.LS3.B (MS-LS4-4); 3.LS4.A (MS-LS4-1),(MS-LS4-2); 3. LS4.B (MS-LS4-4); 3.LS4.C (MS-LS4-6); HS.LS2.A (MS-LS4-4),(MS-LS4-6); HS.LS2.C (MS-LS4-6); HS.LS3.B (MS-LS4-4),(MS-LS4-5),(MS-LS4-6); HS.LS4.A (MS-LS4-1),(MS-LS4-2),(MS-LS4-3); HS.LS4.B (MS-LS4-4),(MS-LS4-6); HS.LS4.C (MS-LS4-4),(MS-LS4-5),(MS-LS4-6); HS.ESS1.C (MS-LS4-1),(MS-LS4-2)

DODEA COLLEGE AND CAREER READY STANDARDS

ELA/Literacy (CCRSL) Connections

SCIENCE	ELA/LITERACY
(MS-LS4-1) (MS-LS4-2) (MS-LS4-3) (MS-LS4-4) (MS-LS4-5)	**RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions
(MS-LS4-1) (MS-LS4-3)	**RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
(MS-LS4-3) (MS-LS4-4)	**RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
(MS-LS4-2) (MS-LS4-4)	**WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
(MS-LS4-5)	**WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
(MS-LS4-2) (MS-LS4-4)	**WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research.
((MS-LS4-2) (MS-LS4-4)	**SL8.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly .
(MS-LS4-2) (MS-LS4-4)	**SL8.4** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Connections

DODEA COLLEGE AND CAREER READY STANDARDS

Mathematics (CCRSM) Connections

SCIENCE	MATHEMATICS
(MS-LS4-6)	**MP.4** Model with mathematics.
(MS-LS4-4) (MS-LS4-6)	**6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
(MS-LS4-4) (MS-LS4-6)	**6.SP.B.5** Summarize numerical data sets in relation to their context.
(MS-LS4-1) (MS-LS4-2)	**6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
(MS-LS4-4) (MS-LS4-6)	**7.RP.A.2** Recognize and represent proportional relationships between quantities.

MS-PS2 Motion and Stability: Forces and Interactions

MS-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.*
[Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.]

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.
[Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.]

MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
[Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.] [Assessment Boundary: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.]

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.
[Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.] [Assessment Boundary: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.]

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.
[Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.] [Assessment Boundary: Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.]

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in grades 6–8 builds from grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.	**PS2.A: Forces and Motion** ▪ For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1)	**Cause and Effect** ▪ Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS2-3),(MS-PS2- 5) **Systems and System Models** ▪ Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. (MS-PS2-1),(MS-PS2-4)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles. (MS-PS2-3) **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions. ▪ Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS2-2) ▪ Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation. (MS-PS2-5) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. ▪ Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1) **Engaging in Argument from Evidence** Engaging in argument from evidence in 6–8 builds from K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.	▪ The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2) ▪ All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MSPS2-2)The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4) **PS2.B: Types of Interactions** ▪ Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3) ▪ Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.(MSPS2-4) ▪ Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, a magnet, or a ball, respectively). (MS-PS2-5)	**Stability and Change** ▪ Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. (MS-PS2-2) -- **Connections to Engineering, Technology, and Applications of Science** **Influence of Science, Engineering, and Technology on Society and the Natural World** ▪ The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-PS2-1)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
▪ Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-PS2-4) -- **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** ▪ Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS2-2),(MS-PS2-4)		

Connections

CONNECTIONS
Connections to other DCIs in this grade-band: MS.PS3.D (MS-PS1-2),(MS-PS1-6); MS.LS1.C (MS-PS1-2),(MS-PS1-5); MS.LS2.A (MS-PS1-3); MS.LS2.B (MS-PS1-5); MS.LS4.D (MS-PS1-3); MS.ESS2.A (MS-PS1-2),(MS-PS1-5); MS.ESS2.C (MS-PS1-1),(MS-PS1-4); MS.ESS3.A (MS-PS1-3); MS.ESS3.C (MS-PS1-3)
Articulation across grade-bands: 5.PS1.A (MS-PS1-1); 5.PS1.B (MS-PS1-2),(MS-PS1-5); HS.PS1.A (MS-PS1-1),(MS-PS1-3),(MS-PS1-4),(MS-PS1-6); HS.PS1.B (MS-PS1-2),(MS-PS1- 4),(MS-PS1-5),(MS-PS1-6); HS.PS3.A (MS-PS1-4),(MS-PS1-6); HS.PS3.B (MS-PS1-6); HS.PS3.D (MS-PS1-6); HS.LS2.A (MS-PS1-3); HS.LS4.D (MS-PS1-3); HS.ESS1.A (MS-PS1- 1); HS.ESS3.A (MS-PS1-3)

DODEA COLLEGE AND CAREER READY STANDARDS

ELA/Literacy (CCRSL) Connections

SCIENCE	ELA/LITERACY
(MS-PS1-2) (MS-PS1-3)	**RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions
(MS-PS1-6)	**RST.6-8.3** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
(MS-PS1-1) (MS-PS1-2) (MS-PS1-4) (MS-PS1-5)	**RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
(MS-PS1-6)	**WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
(MS-PS1-3)	**WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Connections

DODEA COLLEGE AND CAREER READY STANDARDS

Mathematics (CCRSM) Connections	
SCIENCE	MATHEMATICS
(MS-PS1-1) (MS-PS1-2) (MS-PS1-5)	**MP.2** Reason abstractly and quantitatively.
(MS-PS1-1) (MS-PS1-5)	**MP.4** Model with mathematics.
(MS-PS1-1) (MS-PS1-2) (MS-PS1-5)	**6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems.
(MS-PS1-4)	**6.NS.C.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
(MS-PS1-1)	**8.EE.A.3** Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.
(MS-PS1-2)	**6.SP.B.4** Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
(MS-PS1-2)	**6.SP.B.5** Summarize numerical data sets in relation to their context

CCRSS Appendices

	Appendices	Description
A.	Conceptual Shifts	Appendix A addresses the seven conceptual shifts that science educators and stakeholders need to make to effectively use the College and Career Ready Standards for Science.
B.	Responses to Public Drafts	Appendix B shows the results of public feedback and the responses to the standards.
C.	College and Career Readiness	Appendix C describes how the vision for K-12 science education and the content of the standards will properly prepare students for their college and careers.
D.	All Standards, All Students: Case Studies	Appendix D emphasizes that these standards require instructional shifts to enable all students to meet the requirements for college and career readiness and highlights implementation strategies.
E.	Disciplinary Core Idea Progressions	Appendix E presents the DCI learning progressions which demonstrate how each disciplinary core idea develops across the grade bands to ensure students achieve the depth of understanding expected before leaving high school.
F.	Science and Engineering Practices	Appendix F presents the eight Science and Engineering Practices. These mirror the practices of professional scientists and engineers. The SEP progressions illustrate how the SEPs are developed throughout students' K-12 science education.
G.	Crosscutting Concepts	Appendix G presents the seven Crosscutting Concepts. These crosscutting concepts give students an organizational structure to understand the world and help students make sense of and connect DCIs across disciplines and grade bands. The CCC progressions illustrate how the CCC are developed throughout students' K-12 science education.
H.	Nature of Science	Appendix H presents the eight basic understandings about the nature of science. This appendix explains the perspectives, rationale, and research supporting the importance of nature of science in the standards.
I.	Engineering Design in the NGSS	Appendix I describes engineering design and the way it allows students to engage in and aspire to solve major societal and environmental challenges they will face in the decades ahead.
J.	Science, Technology, Society, and the Environment	Appendix J describes the importance of students learning about the relationship between science, technology, society, and the environment.
K.	Model Course Mapping in Middle and High School	Appendix K supports school systems in their decision-making about how to organize science courses to address the MS and HS science standards to prepare students for post-secondary success.
L.	Connections to CCSS-Mathematics	Appendix L highlights the relationship between mathematics and science.
M.	Connections to CCSS-Literacy in Science and Technical Subjects	Appendix M highlights the relationship between literacy and science.

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