Sample Performance Expectations (to study the connections to **Common Core Math**)

MS-PS1-1 Matter and Its Interactions

Develop models to describe the atomic composition of simple molecules and extended structures.

[Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete description of all individual atoms in a complex molecule or extended structure is not required.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop a model to predict and/or describe phenomena.	**PS1.A: Structure and Properties of Matter** • Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. • Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).	**Scale, Proportion, and Quantity** • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Connections to other DCIs in this grade-band: MS.ESS2.C

Articulation of DCIs across grade-bands: 5.PS1.A ; HS.PS1.A ; HS.ESS1.A

Connections to Common Core State Standards in ELA/Literacy:

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-PS1-1)

Connections to Common Core State Standards in Mathematics:

MP.2 Reason abstractly and quantitatively. (MS-PS1-1)

MP.4 Model with mathematics. (MS-PS1-1)

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (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-PS1-1)

5-ESS1-2 Earth's Place in the Universe

Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

[Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data 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 graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.	**ESS1.B: Earth and the Solar System** • The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.	**Patterns** • Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.

Connections to other DCIs in this grade-band: N/A

Articulation of DCIs across grade-bands: 1.ESS1.A ; 1.ESS1.B ; 3.PS2.A ; MS.ESS1.A ; MS.ESS1.B

Connections to Common Core State Standards in ELA/Literacy:

SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS1-2)

Connections to Common Core State Standards in Mathematics:

MP.2 Reason abstractly and quantitatively. (5-ESS1-2)

MP.4 Model with mathematics. (5-ESS1-2)

5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS1-2)

MS-LS4-6 Biological Evolution: Unity and Diversity

Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

[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.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
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.	**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.	**Cause and Effect** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Connections to other DCIs in this grade-band: MS.LS2.A ; MS.LS2.C ; MS.LS3.B ; MS.ESS1.C

Articulation of DCIs across grade-bands: 3.LS4.C ; HS.LS2.A ; HS.LS2.C ; HS.LS3.B ; HS.LS4.B ; HS.LS4.C

Connections to Common Core State Standards in Mathematics:

MP.4 Model with mathematics. (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-LS4-6)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS4-6)

7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-LS4-6)

MS-PS3-1 Energy

Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

[Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. • Construct and interpret graphical displays of data to identify linear and nonlinear relationships.	**PS3.A: Definitions of Energy** • Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.	**PS3.A: Definitions of Energy** • Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.

Connections to other DCIs in this grade-band: MS.PS2.A

Articulation of DCIs across grade-bands: 4.PS3.B ; HS.PS3.A ; HS.PS3.B

Connections to Common Core State Standards in ELA/Literacy:

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-PS3-1)

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-PS3-1)

Connections to Common Core State Standards in Mathematics:

MP.2 Reason abstractly and quantitatively. (MS-PS3-1)

6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. (MS-PS3-1)

7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-PS3-1)

8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1)

8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. (MS-PS3-1)

8.F.A.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS3-1)

Sample Performance Expectations (to study the connections to **Common Core ELA**)

5-ESS3-1 Earth and Human Activity

Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information 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/or other reliable media to explain phenomena or solutions to a design problem.	**ESS3.C: Human Impacts on Earth Systems** • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.	**Systems and System Models** • A system can be described in terms of its components and their interactions. --- **Connections to Nature of Science** **Science Addresses Questions About the Natural and Material World.** • Science findings are limited to questions that can be answered with empirical evidence.

Connections to other DCIs in this grade-band: N/A

Articulation of DCIs across grade-bands: MS.ESS3.A ; MS.ESS3.C ; MS.ESS3.D

Connections to Common Core State Standards in ELA/Literacy:

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-ESS3-1)

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS3-1)

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-1)

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS3-1)

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1)

Connections to Common Core State Standards in Mathematics:

MP.2 Reason abstractly and quantitatively. (5-ESS3-1)

MP.4 Model with mathematics. (5-ESS3-1)

MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics

Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
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(s). • Construct an oral and written argument 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. --- **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** • Science disciplines share common rules of obtaining and evaluating empirical evidence.	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience** • Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.	**Stability and Change** • Small changes in one part of a system might cause large changes in another part.

Connections to other DCIs in this grade-band: MS.LS4.C ; MS.LS4.D ; MS.ESS2.A ; MS.ESS3.A ; MS.ESS3.C

Articulation of DCIs across grade-bands: 3.LS2.C ; 3.LS4.D ; HS.LS2.C ; HS.LS4.C ; HS.LS4.D ; HS.ESS2.E ; HS.ESS3.B ; HS.ESS3.C

Connections to Common Core State Standards in ELA/Literacy:

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-4)

RI.8.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS2-4)

WHST.6-8.1 Write arguments to support claims with clear reasons and relevant evidence. (MS-LS2-4)

WHST.6-8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-4)

HS-PS4-2 Waves and their Applications in Technologies for Information Transfer

Evaluate questions about the advantages of using a digital transmission and storage of information.
[Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in grades 9–12 builds from grades K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. • Evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of a design.	**PS4.A: Wave Properties** • Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses.	**Stability and Change** • Systems can be designed for greater or lesser stability. - **Connections to Engineering, Technology, and Applications of Science** **Influence of Engineering, Technology, and Science on Society and the Natural World** • Modern civilization depends on major technological systems. • Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.

Connections to other DCIs in this grade-band: N/A

Articulation of DCIs across grade-bands: MS.PS4.A ; MS.PS4.B ; MS.PS4.C

Connections to Common Core State Standards in ELA/Literacy:

RST.9-10.8	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. (HS-PS4-2)
RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS4-2)
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-PS4-2)

MS-LS1-6 From Molecules to Organisms: Structures and Processes

Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. [Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.] [Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
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 knowledge, principles, and theories. • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. - **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** • Science knowledge is based upon logical connections between evidence and explanations.	**LS1.C: Organization for Matter and Energy Flow in Organisms** • Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. **PS3.D: Energy in Chemical Processes and Everyday Life** • The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. *(secondary)*	**Energy and Matter** • Within a natural system, the transfer of energy drives the motion and/or cycling of matter.

Connections to other DCIs in this grade-band: MS.PS1.B ; MS.ESS2.A

Articulation of DCIs across grade-bands: 5.PS3.D ; 5.LS1.C ; 5.LS2.A ; 5.LS2.B ; HS.PS1.B ; HS.LS1.C ; HS.LS2.B ; HS.ESS2.D

Connections to Common Core State Standards in ELA/Literacy:

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-6)
RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-6)
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-LS1-6)
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-6)

Connections to Common Core State Standards in Mathematics:

6.EE.C.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-6)

Sample Performance Expectations (to study how **Engineering** is integrated into NGSS)

HS-PS4-5 Waves and their Applications in Technologies for Information Transfer

Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.* [Clarification Statement: Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.] [Assessment Boundary: Assessments are limited to qualitative information. Assessments do not include band theory.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs. • Communicate technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).	**PS3.D: Energy in Chemical Processes** • Solar cells are human-made devices that likewise capture the sun's energy and produce electrical energy. (secondary) **PS4.A: Wave Properties** • Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. **PS4.B: Electromagnetic Radiation** • Photoelectric materials emit electrons when they absorb light of a high-enough frequency. **PS4.C: Information Technologies and Instrumentation** • Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them.	**Cause and Effect** • Systems can be designed to cause a desired effect. **Connections to Engineering, Technology, and Applications of Science** **Interdependence of Science, Engineering, and Technology** • Science and engineering complement each other in the cycle known as research and development (R&D). **Influence of Engineering, Technology, and Science on Society and the Natural World** • Modern civilization depends on major technological systems.

Connections to other DCIs in this grade-band: HS.PS3.A

Articulation of DCIs across grade-bands: MS.PS4.A ; MS.PS4.B ; MS.PS4.C

Connections to Common Core State Standards in ELA/Literacy:

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS4-5)

MS-ETS1-1 Engineering Design

Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

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.	**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.	**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. • 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.

Connections to MS-ETS1.A: Defining and Delimiting Engineering Problems include: Physical Science: MS-PS3-3

Articulation of DCIs across grade-bands: 3-5.ETS1.A ; 3-5.ETS1.C ; HS.ETS1.A ; HS.ETS1.B

Connections to Common Core State Standards in ELA/Literacy:

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1)

WHST.6-8.8 Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. (MS-ETS1-1)

Connections to Common Core State Standards in Mathematics:

MP.2 Reason abstractly and quantitatively. (MS-ETS1-1)

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-ETS1-1)

MS-PS1-3 Matter and its Interactions

Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the syntheic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods. • Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or now supported by evidence.	**PS1.A: Structure and Properties of Matter** • Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. **PS1.B: Chemical Reactions** • Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.	**Structure and Function** • Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. **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. **Influence of Science, Engineering and Technology on Society and the Natural World** • The uses of technologies and any limitation 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. Thus technology use varies from region to region and over time.

Connections to other DCIs in this grade-band: MS.LS2.A ; MS.LS4.D ; MS.ESS3.A ; MS.ESS3.C

Articulation of DCIs across grade-bands: HS.PS1.A ; HS.LS2.A ; HS.LS4.D ; HS.ESS3.A

Connections to Common Core State Standards in ELA/Literacy:

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-PS1-3)

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. (MS-PS1-3)

MS-PS1-3 Matter and its Interactions

Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*

[Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
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(s). • Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience** • Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. **LS4.D: Biodiversity and Humans** • Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary) **ETS1.B: Developing Possible Solutions** • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary)	**Stability and Change** • Small changes in one part of a system might cause large changes in another part. **Connections to Engineering, Technology, and Applications of Science** **Influence of Science, Engineering, and Technology on Society and the Natural World** • The use 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. Thus technology use varies from region to region and over time. **Connections to Nature of Science** **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.

Connections to other DCIs in this grade-band: MS.ESS3.C

Articulation of DCIs across grade-bands: HS.LS2.A ; HS.LS2.C ; HS.LS4.D ; HS.ESS3.A ; HS.ESS3.C ; HS.ESS3.D

Connections to Common Core State Standards in ELA/Literacy:

RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5)

RI.8.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS2-5)

Connections to Common Core State Standards in Mathematics:

MP.4 Model with mathematics. (MS-LS2-5)

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-LS2-5)