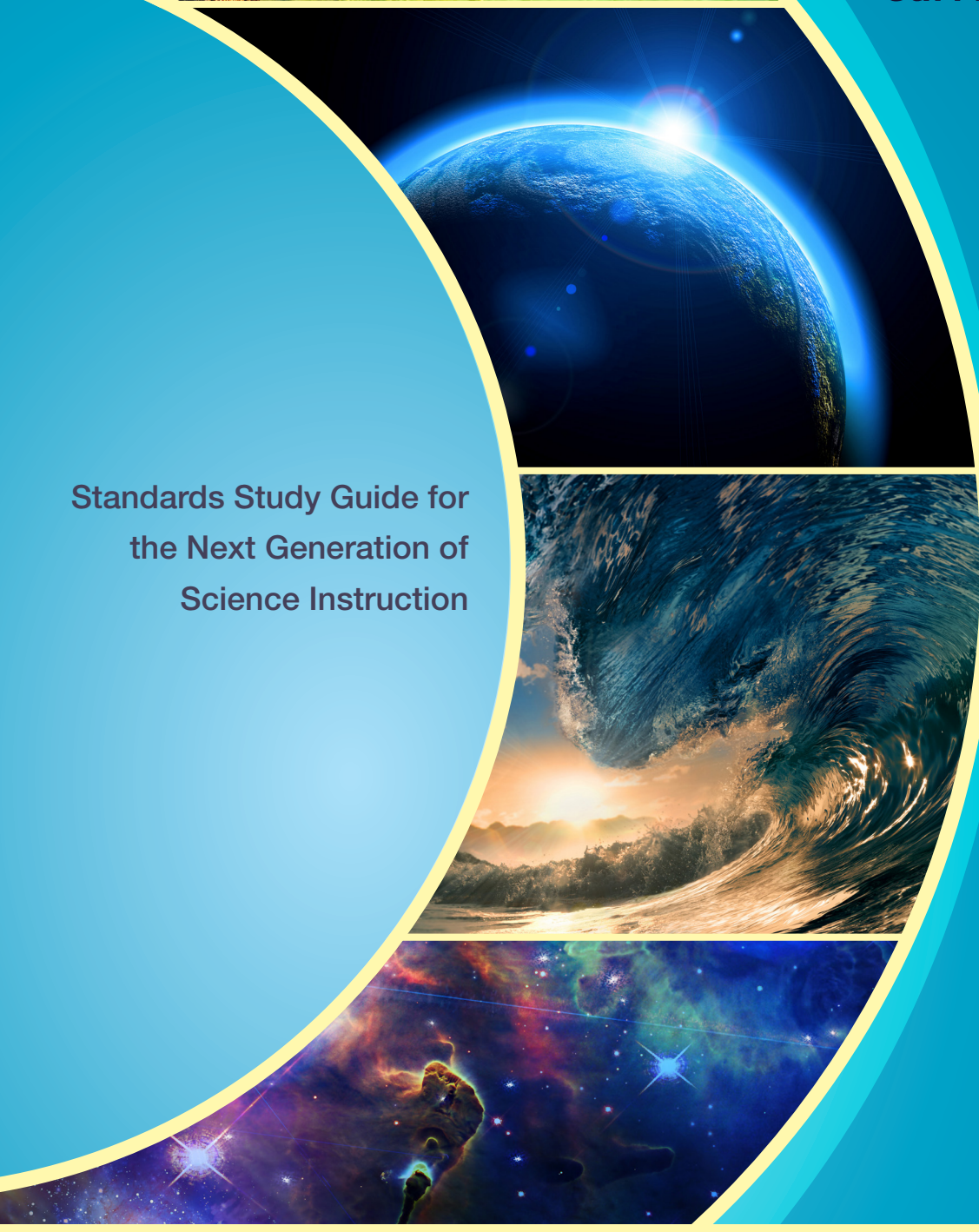
GEMS®

Curriculum Sequences



Standards Study Guide for the Next Generation of Science Instruction

3–8

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Introduction

The Next Generation Science Standards were designed to enhance how science is taught and learned in our nation's classrooms. Carolina supports this comprehensive set of standards, and believes that they will prepare today's students to innovate, lead, and excel in the STEM careers of the future.

Carolina Knows Educators Have Questions about the Next Generation Science Standards

Carolina's Pledge to You

At Carolina, we are committed to helping educators learn how to read, understand, and apply the Next Generation Science Standards. We've created this tool for administrators and teachers that helps make the new standards comprehensible and easy to implement using GEMS® Curriculum Sequences.

Making It Easy

To make your journey toward implementing the Next Generation Science Standards easier, Carolina educators have organized the components of the Next Generation Science Standards documents into one easy-to-read format to help you better understand the new standards, deliver more effective implementation, and become more effective in establishing district support.

Saving You Time

This standards study guide connects all the references of the three-dimensional framework—Core Ideas, Practices, and Crosscutting Concepts—to the units of the Ocean Sciences Sequences and the Space Science Sequences.

Using the Standards Study Guides

This study guide follows the Topic Arrangement prepared by the Next Generation Science Standards writing team. We have organized all the appropriately coded information for each Sequence. To read a study guide, follow the steps below:

1. Select a GEMS Curriculum Sequence.
2. The four columns across the top show the Disciplinary Core Ideas (organized by topic) and the Crosscutting Concepts (organized by grade level) covered in the sequence.
3. The last row of the table includes Science and Engineering Practices and Engineering Design opportunities (organized by grade level) addressed by the Sequence.
4. The units that address each item follow the descriptions, in red.

Disciplinary Core Ideas: Earth Science

4-ESS2.Earth's Systems

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- The locations of mountain ranges, deep ocean trenches,ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water feature areas of Earth. (4-ESS2-2) **UNIT 1**

5-ESS2.Earth's Systems

ESS2.A: Earth Materials and Systems

- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1) **UNIT 1**

ESS2.C: The Roles of Water in Earth's Surface Processes

- Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2) **UNIT 1**

Disciplinary Core Ideas: Life Science

3-LS1.From Molecules to Organisms: Structures and Processes

LS1.B: Growth and Development of Organisms

- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1) **UNIT 2**

3-LS2.Ecosystems: Interactions, Energy, and Dynamics

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (secondary to 3-LS4-4) **UNITS 2, 3**

Disciplinary Core Ideas: Physical Science	Crosscutting Concepts
	Grade 3
	Cause and Effect • Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1), (3-LS4-3) **UNIT 2** **Systems and System Models** • A system can be described in terms of its components and their interactions. (3-LS4-4) **UNITS 2, 3** ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** • Knowledge of relevant scientific concepts and research findings is important in engineering. (3-LS4-3) **UNIT 2** **Patterns** • Patterns of change can be used to make predictions. (3-LS1-1) **UNIT 2**
	Grade 4
	Patterns • Patterns can be used as evidence to support an explanation. (4-ESS2-2) **UNIT 1** **Systems and System Models** • A system can be described in terms of its components and their interactions. (4-LS1-1), (4-LS1-2) **UNIT 2** ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science on Society and the Natural World** • Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2) **UNIT 1**

Disciplinary Core Ideas: Earth Science

5-ESS3.Earth and Human Activity

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. (5-ESS3-1) **UNIT 3**

Disciplinary Core Ideas: Life Science

3-LS4.Biological Evolution: Unity and Diversity

LS4.C: Adaptation

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3) **UNIT 2**

LS4.D: Biodiversity and Humans

- Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4) **UNITS 2, 3**

4-LS1.From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1) **UNIT 2**

5-LS1.From Molecules to Organisms: Structures and Processes

LS1.C: Organization for Matter and Energy Flow in Organisms

- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1) **UNIT 2**
- Plants acquire their material for growth chiefly from air and water. (5-LS1-1) **UNIT 2**

Science and Engineering Practices Grade 3

Analyzing and Interpreting Data **UNIT 2**

Engaging in Argument from Evidence **UNITS 2, 3**

Science and Engineering Practices Grade 4

Analyzing and Interpreting Data **UNIT 1**

Engaging in Argument from Evidence **UNIT 2**

Disciplinary Core Ideas: Physical Science	Crosscutting Concepts
	Grade 5
	Systems and System Models • A system can be described in terms of its components and their interactions. (5-LS2-1) **UNIT 2**; (5-ESS2-1), (5-ESS2-2) **UNIT 3** **Energy and Matter** • Matter is transported into, out of, and within systems. (5-LS1-1) **UNIT 2** ***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. (5-ESS3-1) **UNIT 1** **Influence of Engineering, Technology, and Science on Society and the Natural World** • Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2) **UNIT 3**

Science and Engineering Practices Grade 5	Engineering Design Grades 3–5
Using Mathematics and Computational Thinking **UNIT 2** **Developing and Using Models** **UNIT 2** **Engaging in Argument from Evidence** **UNIT 2** **Obtaining, Evaluating, and Communicating Information** **UNIT 3** **Constructing Explanations and Designing Solutions** **UNIT 3** ***Connections to Nature of Science*** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** **UNIT 2**	**ETS1.B: Developing Possible Solutions** • At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2) ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science on Society and the Natural World** • Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (3-5-ETS-2) **UNIT 3**

Disciplinary Core Ideas: Earth Science	Disciplinary Core Ideas: Life Science
MS-ESS1.Earth's Place In The Universe	**MS-LS1.From Molecules to Organisms: Structures and Processes**
ESS1.C: The History of Planet Earth • The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4)** **UNIT 3**	**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. (MS-LS1-6) **UNIT 2** • Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7) **UNIT 2**

** Introduces some aspects of the Performance Expectations as well as the Practices and the Disciplinary Core Ideas

Disciplinary Core Ideas: Physical Science

MS-PS1.Matter and Its Interactions

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. (MS-PS1-1)** **UNIT 1**
- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4) **UNITS 1, 2**
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4) **UNIT 1**
- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2), (MS-PS1-3)** **UNIT 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) **UNIT 1**

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. (MS-PS1-2), (MS-PS1-3), (MS-PS1-5) **UNIT 2**
- The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5) **UNIT 2**
- Some chemical reactions release energy, others store energy. (MS-PS1-6) **UNIT 2**

Crosscutting Concepts

Crosscutting Concepts

Patterns

- Macroscopic patterns are related to the nature of microscopic and atomic-level structure. **UNIT 1**
- Graphs, charts, and images can be used to identify patterns in data. **UNITS 1, 2, 3**
- Patterns can be used to identify cause and effect relationships. **UNITS 2, 3**
- Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems. **UNITS 2, 3**

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. **UNITS 1, 2, 3**

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. **UNITS 1, 2, 3**

Energy and Matter

- Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).** **UNIT 1**
- The transfer of energy can be tracked as energy flows through a designed or natural system. **UNIT 1**
- Matter is conserved because atoms are conserved in physical and chemical processes. **UNIT 2**
- Within a natural system, the transfer of energy drives the motion and/or cycling of matter. **UNITS 1, 2, 3**

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. **UNITS 1, 2, 3**
- Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. **UNITS 1, 2, 3**

Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural and designed structures/systems can be analyzed to determine how they function. **UNITS 1, 2, 3**
- Structures can be designed to serve particular functions. **UNIT 3**

Disciplinary Core Ideas: Earth Science

MS-ESS2.Earth's Systems

ESS2.A: Earth's Materials and Systems

- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1) **UNITS 2, 3**
- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2) **UNITS 2, 3**

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) **UNIT 1**
- 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. (MS-ESS2-5) **UNITS 1, 3**
- Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4) **UNITS 1, 3**
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6) **UNITS 1, 3**

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) **UNITS 1, 3**
- Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5) **UNIT 3**
- 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) **UNITS 1, 3**

Disciplinary Core Ideas: Life Science

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

LS2.A: Interdependent Relationships in Ecosystems

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1) **UNITS 2, 3**
- Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)** **UNITS 2, 3**

LS2.B: Cycle of Matter and Energy Transfer in Ecosystems

- Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3) **UNIT 2**

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. (MS-LS2-4) **UNITS 2, 3**

** Introduces some aspects of the Performance Expectations as well as the Practices and the Disciplinary Core Ideas

Disciplinary Core Ideas: Physical Science

MS-PS3.Energy

PS3.A: Definitions of Energy**

- The term "heat" as used in everyday language refers both to thermal motion (the motion of atoms or molecules within a substance) and radiation (particularly infrared and light). In science, heat is used only for this second meaning; it refers to energy transferred when two objects or systems are at different temperatures. (secondary to MS-PS1-4) **UNIT 1**
- Temperature is not a measure of energy; the relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (secondary to MS-PS1-4) **UNIT 1**

PS3.B: Conservation of Energy and Energy Transfer

- The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4)** **UNIT 1**
- Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3) **UNIT 1**

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 to MS-LS1-6) **UNIT 2**
- Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7) **UNIT 2**

Crosscutting Concepts

Crosscutting Concepts

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. **UNITS 1, 2, 3**
- Small changes in one part of a system might cause large changes in another part. **UNITS 1, 2, 3**
- Stability might be disturbed either by sudden events or gradual changes that accumulate over time. **UNIT 3**

Influence of Science, Engineering, and Technology on Society and the Natural World

- Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations. **UNITS 1, 2, 3**
- 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. **UNITS 2, 3**
- 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. Thus technology varies from region to region over time. **UNIT 3**

Connections to Nature of Science

Science is a Human Endeavor

- Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. **UNIT 1**
- Advances in technology influence the progress of science and science has influence advances in technology. **UNIT 3**

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. **UNITS 1, 2, 3**

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. **UNIT 3**

Science Addresses Questions About the Natural and Material World

- Science knowledge can describe consequences of actions but does not make the decisions society takes. **UNIT 3**

Disciplinary Core Ideas: Earth Science

MS-ESS3.Earth and Human Activity

ESS3.A: Natural Resources

- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1) **UNITS 2, 3**

ESS3.C: Human Impacts on Earth Systems

- Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3) **UNIT 3**
- Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS-ESS3-3), (MS-ESS3-4) **UNIT 3**

ESS3.D: Global Climate Change

- Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5) **UNIT 3**

Disciplinary Core Ideas: Life Science

Science and Engineering Practices

Developing and Using Models **UNITS 1, 2, 3**

Analyzing and Interpreting Data **UNITS 1, 2, 3**

Obtaining, Evaluating, and Communicating Information **UNITS 1, 2, 3**

Planning and Carrying Out Investigations **UNITS 1, 2, 3**

Constructing Explanations and Designing Solutions **UNITS 1, 2, 3**

Engaging in Argument from Evidence **UNITS 1, 2, 3**

Asking Questions and Defining Problems **UNIT 2, 3**

Using Mathematics and Computational Thinking **UNIT 3**

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence **UNITS 1, 2, 3**

** Introduces some aspects of the Performance Expectations as well as the Practices and the Disciplinary Core Ideas

Disciplinary Core Ideas: Physical Science

MS-PS4.Waves and Their Applications in Technologies for Information Transfer

PS4.B: Electromagnetic Radiation

- When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-2) **UNIT 3**

Crosscutting Concepts

Engineering Design

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) **UNIT 3**

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. (MS-ETS1-2) **UNIT 3**
- Models of all kinds are important for testing solutions. (MS-ETS1-4)** **UNIT 3**

Disciplinary Core Ideas: Earth Science	Disciplinary Core Ideas: Life Science
5-ESS1.Earth's Place in the Universe	
ESS1.A: The Universe and Its Stars • The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1) **UNIT 1** **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. (5-ESS1-2) **UNIT 3**	
MS-ESS1.Earth's Place in the Universe	
ESS1.A: The Universe and Its Stars • Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) **UNITS 3, 4**	
Science and Engineering Practices Grade 3	**Science and Engineering Practices Grade 4**
	Asking Questions and Defining Problems UNIT 4 **Developing and Using Models UNIT 4** **Planning and Carrying Out Investigations UNIT 4** **Analyzing and Interpreting Data UNIT 4** **Constructing Explanations and Designing Solutions UNIT 4** **Engaging in Argument from Evidence UNIT 4** **Obtaining, Evaluating, and Communicating Information UNIT 4**

Space Science Sequence, Grades 3–5

Disciplinary Core Ideas: Physical Science	Crosscutting Concepts
4-PS4.Waves and Their Applications in Technologies for Information Transfer	**Grade 3**
PS4.B: The Universe and Its Stars • An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2) **UNIT 4**	
5-PS2.Motion and Stability: Forces and Interactions	**Grade 4**
PS2.B: Types of Interactions • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1) **UNIT 2**	**Patterns UNIT 4** **Systems and System Models UNIT 4** **Cause and Effect: Mechanism and Explanation UNIT 4**
	Grade 5
	Patterns UNITS 1, 2, 3 **Scale, Proportion, and Quantity UNIT 1** **Systems and System Models UNITS 1, 2, 3** **Cause and Effect: Mechanism and Explanation UNITS 2, 3** **Stability and Change UNIT 3**
Science and Engineering Practices Grade 5	**Engineering Design Grades 3–5**
Asking Questions and Defining Problems UNITS 1, 2, 3 **Developing and Using Models UNITS 1, 2, 3** **Planning and Carrying Out Investigations UNITS 1, 2** **Analyzing and Interpreting Data UNITS 1, 2, 3** **Using Mathematics and Computational Thinking UNITS 1, 2, 3** **Constructing Explanations and Designing Solutions UNITS 1, 2, 3** **Engaging in Argument from Evidence UNITS 1, 2, 3** **Obtaining, Evaluating, and Communicating Information UNITS 1, 2**	

Disciplinary Core Ideas: Earth Science	Disciplinary Core Ideas: Life Science
MS-ESS1.Earth's Place in the Universe	
ESS1.A: The Universe and Its Stars • Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) **UNIT 2** • Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) **UNIT 4** **ESS1.B: ESS1.B: Earth and the Solar System** • This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1) **UNIT 2** • The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2), (MS-ESS1-3) **UNIT 3** • The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2) **UNIT 3**	

Science and Engineering Practices

Asking Questions and Defining Problems **UNITS 1, 2, 3, 4**

Planning and Carrying Out Investigations **UNIT 1**

Developing and Using Models **UNITS 2, 3, 4**

Analyzing and Interpreting Data **UNITS 1, 2, 3, 4**

Using Mathematics and Computational Thinking **UNITS 2, 3, 4**

Constructing Explanations and Designing Solutions **UNITS 1, 2, 3, 4**

Engaging in Argument from Evidence **UNITS 1, 2, 3, 4**

Obtaining, Evaluating, and Communicating Information **UNITS 1, 2, 3, 4**

Disciplinary Core Ideas: Physical Science	Crosscutting Concepts
MS-PS4.Waves and Their Applications in Technologies for Information Transfer	**Crosscutting Concepts**
PS4.A: Wave Properties • A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1) **UNITS 1, 4** **PS4.B: Electromagnetic Radiation** • When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-2) **UNIT 1** • However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2) **UNITS 1, 4**	**Patterns UNITS 1, 2, 3, 4** **Cause and Effect: Mechanism and Explanation UNITS 1, 2, 3, 4** **Scale, Proportion, and Quantity UNITS 1, 2, 3, 4** **Systems and System Models UNITS 1, 2, 3, 4** **Energy and Matter: Flows, Cycles, and Conservation UNITS 1, 2** **Stability and Change UNITS 1, 2, 3, 4**
Engineering Design	

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Standards Study Guide Resources

Learn More about the Next Generation Science Standards

http://www.nextgenscience.org/next-generation-science-standards

GEMS® SEQUENCES

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