Willingboro
Public Schools

"Where Excellence is the Expectation"

Willingboro Public Schools
Grade 8 Science

Revised June, 2022
Jennifer Brandon - Supervisor of Science

Back to Contents Page

SCIENCE CURRICULUM AND INSTRUCTION:

The Willingboro Public Schools Science program is dedicated to delivering our students an innovative hands-on science program. Our program supports the State's vision that scientifically literate students will gain the knowledge and understanding of scientific concepts as required for personal decision-making, participation in civic and cultural affairs, and economic productivity.

Students are encouraged to ask questions about the world around them and practice science skills.

- Students' science experiences teach them to connect science concepts to their experience, see how human nature influences science, and explore how science and technology affects their lives.
- The science classes include activities that engage students in applying their science skills and understandings to examine social issues, solve real problems and make decisions.
- Students have the opportunity to use a variety of equipment and technology in their scientific investigations.
- Students learn how to find out and make up their own minds by experimenting and investigating how the world works rather than just memorizing facts.
- Students are learning how to conduct scientific inquiry and use data to explain their conclusions.
- The process of investigation and explanation is just as important as knowing "the" answer.

Teachers plan instruction that builds on what students know and think to increase students' scientific understanding.

- Teachers use the New Jersey Student Learning Standards in Science to plan lessons that are challenging, engaging and age appropriate.
- There are resources and opportunities for students to do at-home science activities like participating in the STEM Conference.

Course Sequence/Table of Contents:

Click here for the Grade 8 Science Pacing Guide.

Within each unit, please find:

- **Unit Overview**
  - **Content Standards**
  - **District/School Tasks**
- **What This May Look Like**
  - **Essential Questions**
  - **Enduring Understandings**
  - **Assessment**
    - District/School Formative Assessment Plan
    - District/School Summative Assessment Plan
  - **Foundational Science Framework Concepts**
    - Science and Engineering Practices
    - Disciplinary Core Ideas
    - Crosscutting Concepts
  - **Vocabulary**
  - **Suggested Resources**
  - **Instructional Best Practices and Exemplars**
- **Integrated Accommodations and Modifications**
  - **Differentiation**
    - Differentiation - Special Education
    - Differentiation - ELL
    - Differentiation - At Risk
    - Gifted and Talented
    - 504 Plan
  - **Interdisciplinary Connections**
  - **Computer Science and Design Thinking**
  - **Career Readiness Practices**
  - **Pacing Guide Link**

This was modeled after the NJSLS Document

Overview	Content Standards - Arranged by Disciplinary Core Idea (DCI) *Students who demonstrate understanding can:*	Unit Focus
Unit 1 **Chemistry of Materials and Chemical Reactions**	**MS-PS1: Matter and its Interactions** • **MS-PS1-1** 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 depiction of all individual atoms in a complex molecule or extended structure.] • **MS-PS1-2** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. [Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.] [Assessment Boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.] • **MS-PS1-3** 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 synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.] • **MS-PS1-4** Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs.	Properties of materials determine their uses and effect on the environment. Different materials are used for different purposes. Examples explored include properties of plastic, glass, and metal drink containers and water bottles, and the varied properties and uses of plastics in thousands of everyday objects. Students generate and answer questions such as: How do the particle structures of materials vary? How do these structures determine the properties of materials? How do the properties of materials affect their usefulness and impact on the environment? Chemical reactions can be used to solve problems but can also create problems. Examples explored include combining certain substances releases a gas, combining certain substances releases energy (such thermal energy, light, electricity), and combining certain liquids results in a color change or formation of a solid. Students generate and answer questions such as: What happens when new materials are formed? How do particles combine into new substances? How can chemical reactions solve and create problems?

Back to Contents Page

Overview	Content Standards - Arranged by Disciplinary Core Idea (DCI) *Students who demonstrate understanding can:*	Unit Focus
	Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.] ● **MS-PS1-5** Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. [Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.] [Assessment Boundary: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.]	
Unit 1: ***Suggested Open Educational Resources***	● FOSS Next Generation Science Curriculum Resources ○ Think Link ○ Student Resource Books ● Generation Genius	
Unit 2 **Human Interactions with Earth's Resources**	**MS-ESS1: Earth's Place in the Universe** ● **MS-ESS1-4** Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.] **MS-ESS2: Earth's Systems** ● **MS-ESS2-2** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at	In this unit, students will study how the use of natural resources by humans can affect the availability of these resources and how these resources vary in their distribution around the world. Humans affect the availability of natural resources, such as metals, fossil fuels, and freshwater. Examples explored include human use of oil, gas, mineral, and fresh water resources to meet human needs. Students generate and answer questions such as: How are natural resources formed and used? Why do some places have more of certain natural resources than others? How important are natural resources to people? Geoscience processes and human activities change Earth's surface. The landscape is constantly changing due to natural processes and human activity. Examples include formation and destruction of beaches and impacts of homes on cliff erosion. Students generate and answer questions such as: How do earth processes, like wind and flowing water, change Earth's surface? How do human activities change Earth's surface?

Back to Contents Page

Overview	Content Standards - Arranged by Disciplinary Core Idea (DCI) *Students who demonstrate understanding can:*	Unit Focus
	varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.] • **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-ESS3: Earth and Human Activity** • **MS-ESS3-1** Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically nonrenewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).] • **MS-ESS3-3** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. [Clarification Statement: Examples of the design process include examining human environmental impacts,	

Back to Contents Page

Overview	Content Standards - Arranged by Disciplinary Core Idea (DCI) *Students who demonstrate understanding can:*	Unit Focus
	assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).] ● **MS-ESS3-4** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]	
Suggested Open Educational Resources	● FOSS Next Generation Science Curriculum Resources ○ Think Link ○ Student Resource Books ● Generation Genius	
Unit 3 **Evolution**	**MS-LS3: Heredity: Inheritance and Variation of Traits** ● **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 types of mutations.] **MS-LS4: Biological Evolution: Unity and Diversity**	In this unit, the students will study how people can affect and be affected by evolution. Populations change over time. Some changes take place over very long time periods, while others take place over observable time periods. People can cause and be affected by these changes. Examples include: there are more life forms now than there were in the past; some kinds of organisms have gone extinct, like large dinosaurs; organisms that are harmful, like some bacteria and pests, have developed resistance to our methods of eliminating them. In this unit of study, students connect fossil records to evidence of evolution, anatomical similarities of the relationships among organisms and species, and natural selection. Students search for patterns in the

Back to Contents Page

Overview	Content Standards - Arranged by Disciplinary Core Idea (DCI) *Students who demonstrate understanding can:*	Unit Focus
	• **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 the 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,	evidence to support their understanding of the fossil records, demonstrating how those patterns show relationships between modern organisms and their common ancestors. They will use ideas of genetic variation in a population to make sense of how organisms survive and reproduce, thus passing on the traits of the species. Students generate and answer questions such as: How have populations changed over time? What caused these changes? How are people affected by and affecting evolution? Are people causing a mass extinction?

Overview	**Content Standards - Arranged by Disciplinary Core Idea (DCI)** *Students who demonstrate understanding can:*	**Unit Focus**
	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.]	
Unit 3: *Suggested Open Educational Resources*	● FOSS Next Generation Science Curriculum Resources ○ Think Link ○ Student Resource Books ● Generation Genius	

Unit 1 Chemistry of Materials and Chemical Reactions : Life and Physical Sciencs

Overview

Properties of materials determine their uses and effect on the environment. Different materials are used for different purposes. Examples explored include properties of plastic, glass, and metal drink containers and water bottles, and the varied properties and uses of plastics in thousands of everyday objects. Students generate and answer questions such as: How do the particle structures of materials vary? How do these structures determine the properties of materials? How do the properties of materials affect their usefulness and impact on the environment?

Chemical reactions can be used to solve problems but can also create problems. Examples explored include combining certain substances releases a gas, combining certain substances releases energy (such thermal energy, light, electricity), and combining certain liquids results in a color change or formation of a solid. Students generate and answer questions such as: What happens when new materials are formed? How do particles combine into new substances? How can chemical reactions solve and create problems?

Essential Questions	Enduring Understandings
Overarching Driving Questions: *How do the particle structures of materials vary?* *How do these structures determine the properties of materials?* *How do the properties of materials affect their usefulness and impact on the environment?* *What happens when new materials are formed?* *How do particles combine into new substances?* *How can chemical reactions solve and create problems?* ● What information would help you decide which material is best for making a single- use drink container? (Activity 1) ● How can scientists use physical properties to identify elements? (Activity 2) ● How do the properties of materials determine their uses? (Activity 3) ● How can you use the mass and volume of an object to calculate its density? (Activity 4) ● How can information be evaluated for bias? (Activity 5) ● Why do materials have unique properties? ● How do atoms combine to form molecules? (Activity 6) ● How do the structures of particles in substances vary? (Activity 7) ● How does the particle structure of matter explain the differences between solids, liquids, and gases? (Activity 8) ● What happens when gas particles are heated or cooled? (Activity 9) ● What happens to the particles and temperature of a substance as it changes state? (Activity 10) ● How do a material's properties affect its uses?	**Anchoring Phenomena:** *Different materials are used for different purposes.* *Chemical reactions can be used to solve problems but can also create problems* ● Materials like plastics, metals, and glass are all useful, but they can also affect the environment. ● Different materials have different properties, production, and wastes. ● There are advantages and disadvantages of using materials for various purposes. ● All materials are made from a limited number of elements (each having characteristic properties and atoms). ● Properties such as color, solubility, density, and melting and boiling point determine the uses of materials. ● A substance's density can be calculated and used both to identify substances and to select substances for various uses. ● Although Web resources may have points of view and biases, it is possible to obtain information about the resources used to make materials, the advantages of these materials for solving problems, and the impact of these materials on society. ● Even though we can't see atoms, they make up all the stuff around us. ● Substances have specific structures that can be modeled by arranging atomic models in various ways. ● A closer look at particles explains more properties, such as density and solubility. ● Some substances, such as water, can exist as a solid, liquid, or gas.

Back to Contents Page

• How are plastics engineered for various uses? (Activity 11) • How do the structures of plastics relate to their varied properties? (Activity 12) • What are the benefits and tradeoffs of different plastics? (Activity 13) • What are the wastes from producing circuit boards, and is there anything we can do about them? • What happens when chemical processes are used to produce electronic devices? (Activity 1) • How can you tell if a chemical change has occurred? (Activity 2) • What is the difference between a physical and a chemical change? (Activity 3) • Is the phenomenon observed a physical change or a chemical change (reaction)? (Activity 5) • How is mass conserved during a chemical reaction? • What happens to atoms and molecules during a chemical reaction? (Activity 4) • What happens to the mass of the reactants during a chemical reaction? (Activity 6) • Why is mass always conserved in chemical reactions? (Activity 7) • How can chemical reactions be used to provide energy? • How can we improve the design of a chemical battery? (Activity 8) • What does thermal energy have to do with chemical reactions? (Activity 9) • How do engineers design and test a prototype hand warmer? (Activity 10) • How can the hand warmer design prototypes be redesigned and improved? (Activity 11) • What are the wastes from producing circuit boards, and is there anything we can do about them? • Which metal is best at reclaiming copper from the used copper chloride solution? (Activity 12) • What is the best option for reclaiming copper metal from the used copper chloride solution? (Activity 13)	• At room temperature, some substances are solid while others are liquid or gas. Particle models, including models of the distances between particles and their motions, help explain the differences between the states of matter. • Particle motion also helps explain the properties of a substance as temperature changes. Increased temperature indicates increased particle motion (kinetic energy). Decreased temperature indicates decreased particle motion (kinetic energy). • Transfer of thermal energy to a substance increases the substance's average kinetic energy (temperature) except during a change of state. • Materials like plastics, metals, and glass are all useful, but they can also affect the environment. • Plastics are synthetic materials that can be designed with a variety of structures and functions. • The structure of a plastic causes it to have specific properties that allow plastics to be engineered to have a wide range of properties and, thus, uses. • Synthetic materials, such as plastics, are made from natural resources and have many impacts, both positive and negative, on human health and the environment. • Sometimes when we make a product, we get side products that we don't want. • Chemical reactions are used to produce desirable products (circuit boards), but they also lead to production of wastes (by-products) from chemical processes. (Substances can be identified by their properties and can't be made to just "go away.") • When you mix some substances, they do things like fizz, change color, disappear or change temperature. • Four common signs may frequently indicate that chemical reactions have taken place. • Careful observation of properties is needed to distinguish physical and chemical changes. These macroscopic changes can be explained by what is happening at the level of atoms and molecules. • In this activity, students apply what they have learned about physical and chemical changes to several scenarios. • In chemical reactions, the total amount of matter after the reaction is the same as the total amount of matter before the reaction. • Atoms are reorganized and conserved in chemical reactions. Changes in the organization of particles at the atomic/ molecular scale helps to explain physical and chemical changes and to distinguish one from the other. • The total mass of the products of a reaction equals the total mass of the reactants. • The conservation of atoms during reactions explains the conservation of mass.

	• When you mix some chemicals, they get hot or cold or give off electricity or light. • Changing certain variables can affect how much energy is produced from a reaction. • Chemical reactions can be used to release or absorb thermal energy. • Variables can be modified as a device, such as a cold pack, is designed and refined through testing. • Sometimes when we make a product, we get side products that we don't want—but we can do something about it. • Several chemical reactions can be used to reclaim copper from circuit board production, and the best reaction to use can be evaluated based on several criteria.

Unit Chemistry of Materials and Chemical Reactions: Life and Physical Sciences
NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)
Students who demonstrate understanding can:
MS-PS1: Matter and its Interactions • **MS-PS1-1** 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 depiction of all individual atoms in a complex molecule or extended structure.] • **MS-PS1-2** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. [Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.] [Assessment Boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.] • **MS-PS1-3** 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 synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.] • **MS-PS1-4** Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]

Back to Contents Page

Unit Chemistry of Materials and Chemical Reactions: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

- **MS-PS1-5** Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. [Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.] [Assessment Boundary: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.]

Science and Engineering Practices

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. (MS-PS1-1), (MS-PS1-4)
  - Develop a model to describe unobservable mechanisms. (MS-PS1-5)

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.
  - Analyze and interpret data to determine similarities and differences in findings. (MS-PS1-2)

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.
  - Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)

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 not supported by evidence. (MS-PS1-3)

Disciplinary Core Ideas

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)
- 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)
- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)
- 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)
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1)
- 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)

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)

Back to Contents Page

Unit Chemistry of Materials and Chemical Reactions: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

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

PS3.A: Definitions of Energy

- The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4)
- The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (secondary to MS-PS1-4)

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. (secondary to MS-PS1-6)

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 the characteristics may be incorporated into the new design. (secondary to MS-PS1-6)
- 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. (secondary to MS-PS1-6)

Crosscutting Concepts

Patterns

- Macroscopic patterns are related to the nature of microscopic and atomic-level structure. (MS-PS1-2)

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)

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. (MS-PS1-1)

Energy and Matter

- Matter is conserved because atoms are conserved in physical and chemical processes. (MS-PS1-5)
- The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS1-6)

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. (MS-PS1-3)

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-PS1-3)

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

Unit Chemistry of Materials and Chemical Reactions: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

- 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 use varies from region to region and over time. (MS-PS1-3)

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-PS1-2)

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5)

Student Learning Objectives

Students will be able to….

- Develop a model of a simple molecule.
- Use the model of the simple molecule to describe its atomic composition.
- Develop a model of an extended structure.
- Use the model of the extended structure to describe its repeating subunits.
- Analyze and interpret data to determine similarities and differences from results of chemical reactions between substances before and after they undergo a chemical process.
- Analyze and interpret data on the properties of substances before and after they undergo a chemical process.
- Identify and describe possible correlation and causation relationships evidenced in chemical reactions.
- Make logical and conceptual connections between evidence that chemical reactions have occurred and explanations of the properties of substances before and after they undergo a chemical process.
- Develop a model that predicts and describes changes in particle motion that could include molecules or inert atoms or pure substances.
- Use cause-and-effect relationships to predict changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed in natural or designed systems.
- Obtain, evaluate, and communicate information to show that synthetic materials come from natural resources and affect society.
- Gather, read, and synthesize information about how synthetic materials formed from natural resources affect society.
- Assess the credibility, accuracy, and possible bias of each publication and the methods used in the publication.
- Describe how information about how synthetic materials formed from natural resources affect society is supported or not supported by evidence.
- Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
- Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy.
- 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.

Integrated Accommodations and Modifications		
Special Education Students	**English Language Learners**	**At Risk**
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed Appendix A: Special Education Accommodations and Modifications	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	504 Plan
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and practice

- Gear assignments to development in areas of affect, creativity, cognition, and research skills
- Allow for a variety in types of resources
- Provide problem-based assignments with planned scope and sequence
- Utilize inquiry-based instruction
- Adjust the pace of lessons
- Utilize Choice Boards
- Provide Problem-Based Learning
- Establish flexible Grouping

- Model skills / techniques to be mastered.
- Provide extended time to complete class work
- Provide copy of class notes
- Break long assignments into smaller parts
- Assist student in setting short term goals
- Allow for preferential seating to be mutually determined by the student and teacher
- Provide extra textbooks for home.
- Model and reinforce organizational systems (i.e. color-coding)
- Write out homework assignments, check student's recording of assignments

Interdisciplinary Connections

Connections to NJSLS - English Language Arts

Reading

- 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-PS1-2), (MS-PS1-3)
- RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)
- 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), (MS-PS1-2), (MS-PS1-4), (MS-PS1-5)

Writing

- 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-PS1-6)
- 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)

Connections to NJSLS - Mathematics

- MP.2 Reason abstractly and quantitatively. (MS-PS1-1), (MS-PS1-2), (MS-PS1-5)

Computer Science and Design Thinking

Computer Science and Design Thinking Practices

1. ✓ Fostering an Inclusive Computing and Design Culture
2. ✓ Collaborating Around Computing and Design
3. ✓ Recognizing and Defining Computational Problems
4. ✓ Developing and Using Abstractions
5. ✓ Creating Computational Artifacts
6. ✓ Testing and Refining Computational Artifacts
7. ✓ Communicating About Computing and Design

Computer Science and Design Thinking Standards

8.1 Computer Science

Impacts of Computing

- Advancements in computing technology can change individuals' behaviors. Society is faced with trade-offs due to the increasing globalization and automation that computing brings
  - 8.1.8.IC.1: Compare the trade-offs associated with computing technologies that affect individuals' everyday activities and career options.
  - 8.1.8.IC.2: Describe issues of bias and accessibility in the design of existing technologies

Data and Analysis

- MP.4 Model with mathematics. (MS-PS1-1), (MS-PS1-5)
- 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1), (MS-PS1-2), (MS-PS1-5)
- 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. (MS-PS1-4)
- 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)
- 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 (MS-PS1-2)

- People use digital devices and tools to automate the collection, use, and transformation of data. The manner in which data is collected and transformed is influenced by the type of digital device(s) available and the intended use of the data.
    - 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
- Computer models can be used to simulate events, examine theories and inferences, or make predictions.
    - 8.1.8.DA.5: Test, analyze, and refine computational models.
    - 8.1.8.DA.6: Analyze climate change computational models and propose refinements.

Algorithms & Programming

- Programmers create variables to store data values of different types and perform appropriate operations on their values.
    - 8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values.

8.2 Design Thinking

Engineering Design

- Engineering design is a systematic, creative, and iterative process used to address local and global problems. The process includes generating ideas, choosing the best solution, and making, testing, and redesigning models or prototypes.
    - 8.2.8.ED.1: Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
    - 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.
    - 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
    - 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team
- Engineering design requirements and specifications involve making trade-offs between competing requirements and desired design features.
    - 8.2.8.ED.5: Explain the need for optimization in a design process.
    - 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product.
    - 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches)

	Interaction of Technology and Humans ● Economic, political, social and cultural aspects of society drive development of new technological products, processes, and systems. ○ 8.2.8.ITH.1: Explain how the development and use of technology influences economic, political, social, and cultural issues. ● Technology interacts with society, sometimes bringing about changes in a society's economy, politics, and culture, and often leading to the creation of new needs and wants. New needs and wants may create strains on local economies and workforces. Improvements in technology are intended to make the completion of tasks easier, safer, and/or more efficient ○ 8.2.8.ITH.2: Compare how technologies have influenced society over time. ○ 8.2.8.ITH.3: Evaluate the impact of sustainability on the development of a designed product or system. ○ 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. ○ 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. *Nature of Technology* ● Technology advances through the processes of innovation and invention which relies upon the imaginative and inventive nature of people. Sometimes a technology developed for one purpose is adapted to serve other purposes. Engineers use a systematic process of creating or modifying technologies that is fueled and constrained by physical laws, cultural norms, and economic resources. Scientists use systematic investigation to understand the natural world. ○ 8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem. ○ 8.2.8.NT.2: Analyze an existing technological product that has been repurposed for a different function. ○ 8.2.8.NT.3: Examine a system, consider how each part relates to other parts, and redesign it for another purpose. ○ 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. *Effects of Technology on the Natural World* ● Resources need to be utilized wisely to have positive effects on the environment and society. Some technological decisions involve tradeoffs between environmental and economic needs, while others have positive effects for both the economy and environment.

	○ 8.2.8.ETW.1: Illustrate how a product is upcycled into a new product and analyze the short- and long-term benefits and costs. ○ 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). ○ 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. ○ 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best. *Ethics and Culture* ● Technological disparities have consequences for public health and prosperity. ○ 8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies. ○ 8.2.8.EC.2: Examine the effects of ethical and unethical practices in product design and development.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community member and employee.
- Attend to financial well-being.
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity, increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

Career Readiness, Life Literacies and Key Skills Standards

9.1 Personal Financial Literacy

Civic Financial Responsibility

- Individuals can use their talents, resources, and abilities to give back.
  - 9.1.8.CR.2: Compare various ways to give back through strengths, passions, goals, and other personal factors.

Economic and Government Influences

- There are government agencies and policies that affect the financial industry and the broader economy
  - 9.1.8.EG.5: Interpret how changing economic and societal needs influence employment trends and future education.

9.2 Career Awareness, Exploration, Preparation, and Training

Career Awareness and Planning

- Different types of jobs require different knowledge and skills.
    - 9.1.2.CAP.1: Make a list of different types of jobs and describe the skills associated with each job.
- An individual's passions, aptitude and skills can affect his/her employment and earning potential.
    - 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
    - 9.2.5.CAP.2: Identify how you might like to earn an income.
    - 9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
    - 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
- Income and benefits can vary depending on the employer and type of job or career.
    - 9.2.5.CAP.5: Identify various employee benefits, including income, medical, vacation time, and lifestyle benefits provided by different types of jobs and careers.
- An individual's strengths, lifestyle goals, choices, and interests affect employment and income
    - 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest.
    - 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
    - 9.2.8.CAP.4: Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.
- Developing and implementing an action plan is an essential step for achieving one's personal and professional goals
    - 9.2.8.CAP.5: Develop a personal plan with the assistance of an adult mentor that includes information about career areas of interest, goals and an educational plan
- There are variety of resources available to help navigate the career planning process
    - 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.

9.4 Life Literacies and Key Skills

Creativity and Innovation

- Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
    - 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
    - 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3).
    - 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
    - 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.

Critical Thinking and Problem-solving

- Multiple solutions often exist to solve a problem.
    - 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
    - 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1)

- An essential aspect of problem solving is being able to self-reflect on why possible solutions for solving problems were or were not successful.
    - 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.

Digital Citizenship

- Detailed examples exist to illustrate crediting others when incorporating their digital artifacts in one's own work.
    - 9.4.8.DC.1: Analyze the resource citations in online materials for proper use.
    - 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8)
- Digital communities are used by individuals to share information, organize, and engage around issues and topics of interest.
    - 9.4.8.DC.7: Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys.
- Digital technology and data can be leveraged by communities to address effects of climate change.
    - 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).

Global and Cultural Awareness

- Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction
    - 9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).
    - 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.

Information and Media Literacy

- Increases in the quantity of information available through electronic means have heightened the need to check sources for possible distortion, exaggeration, or misrepresentation.
    - 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.
    - 9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.
- Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated.
    - 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
    - 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
- The mode of information can convey a message to consumers or an audience.
    - 9.4.8.IML.6: Identify subtle and overt messages based on the method of communication.
- Sources of information are evaluated for accuracy and relevance when considering the use of information.
    - 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b).
- There is a need to produce and publish media that has information supported with quality evidence and is intended for authentic audiences.
    - 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.

Technology Literacy

- Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others
    - 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
    - 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
    - 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.
    - 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MS-LS4-5, 6.1.8.CivicsPI.3).

Climate Change

Addressed in Units 2 and 3

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

https://www.nj.gov/education/safety/wellness/selearning/index.shtml

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards. Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: ● Pre-Assessment ● Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) ● Exit tickets, rotational activities (stations), quizzes, and small group activities ● Classwork, homework, group work (formative assessment) ● Teacher's observation, class discussion, and Student Notebook	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* **Benchmark Assessments:** ● Assessment 1.1: Mid-Unit Assessment ● Assessment 1.2: End of Unit Assessment ● Assessment 1.3: End of Unit Performance Assessment **Standardized Assessments:** ● NJSLA **Other Summative Assessments:** Teachers are encouraged to design and implement their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

Materials, substances, chemical reactions, particles, elements, atoms, properties, solubility, density, density, temperature, heating, cooling, melting point, boiling point, production, wastes, mass, conservation of mass, volume, state of matter, solid, liquid, gas, kinetic energy, thermal energy, electricity, circuits, natural materials, synthetic materials, metal, plastic, glass, physical changes, chemical changes, macroscopic changes, reagents, products, variables, testing, prototype, bias,

District/School Tasks	District/School Primary and Supplementary Resources
• Common Formative Assessments • Common District Summative Assessments • See above Assessment Sections for more information	**District-Mandated Resources** • Lab-Aides Curriculum **Assessment Resources:** • Available on Lab-Aides.com • For additional resources, log in to https://edconnectnj.schoolnet.com **Other Resources:** • Generation Genius: "Human Impact on the Environment", "Properties of Elements", "Synthetic Materials", "Chemical Reactions", "Atoms and Molecules" • Warm-Up Activities: Amistad Activity, SEL Activity, Holocaust Activity, Climate Change Activity, LGBTQ+/Disabilities • Current Events, Articles: Readworks, Newsela, Scholastic Magazine (Science World) • Simulations, Videos, Games: Scholastic Study Jams, The Science Spot, PBS Learning Media, PhET, Gizmos • Activities, and Lessons: Discovery Education Techbook, Steve Spangler, Kesler Science, Science Buddies, Generation Genius • Youtube Channels (MooMooMath and Science, TedEd, CrashCourse, Sick Science, Teacher's Pet, etc.) • The Importance of Embracing Questions (SEL Resource) • Research famous scientists and possible STEM Careers: Learning for Justice: STEM at Work **(Amistad Law Resource)** • How Jewish refugees Contributed to and Revolutionized Science in the US (Holocaust Law) **Project Ideas:**

	• Properties of Materials gallery walk - each student researches a different material (its properties, uses, and limitations) to present
Instructional Best Practices and Exemplars	
See Appendix A for Instructional Best Practices and Exemplars	
Pacing Guide	
Grade 8 Science Pacing Guide	

Unit 2 Human Interactions with Earth's Resources: Life and Physical Sciences

Overview

In this unit, students will study how the use of natural resources by humans can affect the availability of these resources and how these resources vary in their distribution around the world. Humans affect the availability of natural resources, such as metals, fossil fuels, and freshwater. Examples explored include human use of oil, gas, mineral, and fresh water resources to meet human needs. Students generate and answer questions such as: How are natural resources formed and used? Why do some places have more of certain natural resources than others? How important are natural resources to people?

Geoscience processes and human activities change Earth's surface. The landscape is constantly changing due to natural processes and human activity. Examples include formation and destruction of beaches and impacts of homes on cliff erosion. Students generate and answer questions such as: How do earth processes, like wind and flowing water, change Earth's surface? How do human activities change Earth's surface?

Essential Questions	Enduring Understandings
Overarching Driving Questions: *How are natural resources formed and used?* *Why do some places have more of certain natural resources than others?* *How important are natural resources to people?* *How do earth processes, like wind and flowing water, change Earth's surface?* *How do human activities change Earth's surface?* ● Where and how are natural resources found and used? ● What are natural resources? (Activity 1) ● How has an increase in human population affected resource consumption? (Activity 2) ● What makes one mineral resource different from another? (Activity 3) ● How are natural resources used globally? (Activity 4) ● How are underground deposits of natural resources located? (Activity 5) ● What role have geoscience processes played in the formation of natural resources? ● How are resources extracted from the earth? (Activity 6) ● How are natural resources formed? (Activity 7) ● How does groundwater form, and how is it extracted? (Activity 8) ● How do you use evidence to determine when major events in Earth's history have occurred? ● Which rock layers are the oldest? (Activity 9)	**Anchoring Phenomenon:** *Humans affect the availability of natural resources, such as metals, fossil fuels, and freshwater.* *The landscape is constantly changing due to natural processes and human activity.* ● The availability and use of natural resources (eg., copper, oil, freshwater) varies around the world. ● Nonrenewable resources are found on Earth, and people value some of these resources more than others. ● The consumption of natural resources has changed over time due in part to changes in human population. ● The characteristics and properties of natural resources vary ● Per capita consumption varies country by country. ● Energy resources are distributed unevenly in particular geographic areas. ● Geologists use what they know about geological features to predict where they can find resources. ● Natural resources must be extracted from the earth, and such extractions have environmental impacts. ● Resources such as petroleum and metal ores form by different processes (including volcanic activity and weathering) over long periods of time.

Back to Contents Page

• When did particular events in Earth's history occur? (Activity 10) • How long have organisms been living on Earth? (Activity 11) • How are rock strata and fossils used to sequence Earth's history? (Activity 12) • What decisions do people make that affect natural resource consumption? • How is a growing human population and increasing resource consumption impacting the earth? (Activity 13) • What action should be taken to meet the needs of a growing population? (Activity 14) • How can people mitigate the negative impact on the land and water when building new construction? • What is the human impact of constructing buildings? (Activity 1) • Which site is the best choice for the school and fields? (Activity 15) • How can you design the new school and fields to mitigate the human impact on the environment? (Activity 16) • How do human activities on land negatively impact water quality? • Which liquid best dissolves salts? (Activity 2) • What can water-quality indicators show? (Activity 3) • How can organisms living in a stream indicate water quality? (Activity 4) • Can using fertilizers have harmful effects on the environment? (Activity 5) • How does nutrient runoff affect the environment? (Activity 6) • How does the water movement through the water cycle move energy and matter? • Which liquid best dissolves salts? (Activity 2) • How does moving water affect the areas it flows through? (Activity 7) • How does water move around the planet? (Activity 8) • How can we mitigate modern society's harmful effects on Earth's water? (Activity 9) • How do human activities interact with the processes of erosion and deposition? • How does a topographic map show landforms? (Activity 10) • How can topographic maps help you evaluate potential building sites? (Activity 11) • How can we reduce the effects of ocean waves on coastal areas? (Activity 12) • What happens when earth processes move soil and rocks from one place to another? (Activity 13) • What has been the human impact on geologic processes of the Mississippi River Delta? (Activity 14) • How can we engineer structures to mitigate environmental impact? • How does moving water affect the areas it flows through? (Activity 7) • How can we reduce the effects of waves on coastal areas? (Activity 12) • What has been the human impact on geologic processes of the Mississippi River Delta? (Activity 14)	• Groundwater is distributed unevenly on Earth's surface and affects the formation of natural resources. • Natural resources have formed over Earth's 4.6- billion-year history. • Deposition and compaction are processes that help form sedimentary rock. • Fossils provide evidence of organisms that lived in the past. • Rock strata and fossils are used to establish the sequence of events in Earth's history. • Human decisions will affect the future availability of natural resources. • The growing human population is increasingly using Earth's natural resources. • Natural resources are distributed unevenly, and people make decisions about their extraction. • Land development by humans has an impact on the environment. • Human population growth leads to the need for more use of land and water resources and more impact on these resources. Responsible development reduces this impact where possible. • Human activity disrupts water quality. • Substances dissolved in the earth's water affect water quality and animal habitats. Water movement is driven by gravity though and on top of soil. As it moves, water can pick up and dissolve contaminants such as excess nutrients from fertilizers. These contaminants reduce water quality. • As water moves through the water cycle, it can dissolve and carry substances from one location to another. • Water moving through the soil and on top the surface is part of a greater system of water movement. This global system is the water cycle and it moves water and contaminants around the planet. • Humans disrupt geologic processes. • Water running through the land can move sediments from one location to another. The geologic processes of erosion and deposition have occurred for millions of years but humans have disrupted this natural movement of materials and have changed land formations. Building on the land accelerates the movement of sediments. The outcomes of these geologic processes are altered when wetlands are filled in, farms are created, vegetation is removed, and/or the hard surfaces of buildings are installed. • Engineering can help mitigate the problem of habitat destruction and land mismanagement. • Changes in the land and water can be monitored to help in the effort to mitigate impact. People can develop design solutions while building to reduce negative outcomes on the environment. Humans controlling water flow does not always reduce the impact, but thoughtful designs can be beneficial. Building designs can be evaluated to determine how well they meet specific design criteria and constraints in an effort to reduce impact on the environment.

• How can you design the new school to mitigate the human impact on the environment? (Activity 16)	

Unit 2 Human Interactions with Earth's Resources Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

Students who demonstrate understanding can:

MS-ESS1: Earth's Place in the Universe

- **MS-ESS1-4** Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]

MS-ESS2: Earth's Systems

- **MS-ESS2-2** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]
- **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-ESS3: Earth and Human Activity

- **MS-ESS3-1** Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically nonrenewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]
- **MS-ESS3-3** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]
- **MS-ESS3-4** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as

Unit 2 Human Interactions with Earth's Resources Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

Science and Engineering Practices

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 describe unobservable mechanisms. (MS-ESS2-4)

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.
  - 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. (MS-ESS1-4), (MS-ESS2-2), (MS-ESS3-1)
  - Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)

Engaging in Argument from Evidence

- Engaging in argument from evidence in 6–8 builds on grades 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. (MS-ESS3-4)

Disciplinary Core Ideas

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)

ESS2.A: Earth's Materials and Systems

- 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)

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)
- Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4)
- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2)

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)

ESS3.C: Human Impacts on Earth Systems

Unit 2 Human Interactions with Earth's Resources Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

- 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) 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)

Crosscutting Concepts

Cause and Effect

- Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3)
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-4)

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. (MS-ESS1-4)

Energy and Matter

- Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)

Connections to Engineering, Technology, and Applications of Science

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-ESS3-1), (MS-ESS3-4)
- 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 use varies from region to region and over time. (MS-ESS3-3)

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. (MS-ESS3-4)

Student Learning Objectives

Students will be able to...

- Construct a scientific explanation based on valid and reliable evidence from rock strata obtained from sources (including the students' own experiments).
- Construct a scientific explanation based on rock strata 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.

- Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
- Construct a scientific explanation for how geoscience processes have changed Earth's surface at varying time and spatial scales based on valid and reliable evidence obtained from sources (including the students' own experiments).
- Construct a scientific explanation for how geoscience processes have changed Earth's surface at varying time and spatial scales based on 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.
- Collect evidence about processes that change Earth's surface in time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges).
- Collect evidence about processes that change Earth's surface in small time and spatial scales. (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events.
- Analyze and interpret data such as distributions of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions.
- Analyze how science findings have been revised and/or reinterpreted based on new evidence about past plate motions.
- explore how earth's natural resources take millions of years to regenerate and determine why resources are different in quantity and type in different regions of the world.
- Investigate the results of human impact and predict if another mass extinction will occur.
- Understand the relationship between available resources and where people choose to live, calculate their carbon and ecological footprints and develop solutions on how to reduce them.

Integrated Accommodations and Modifications		
Special Education Students	**English Language Learners**	**At Risk**
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments.

• Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed Appendix A: Special Education Accommodations and Modifications	• Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	**504 Plan**
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments
Interdisciplinary Connections	**Computer Science and Design Thinking**

Connections to NJSLS - English Language Arts

Reading

- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-4), (MS-ESS2-2), (MS-ESS3-1), (MS-ESS3-4)

Writing

- WHST.6-8.1 Write arguments focused on discipline content. (MS-ESS3-4)
- 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-ESS1-4), (MS-ESS2-2), (MS-ESS3-1)
- 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-ESS3-3)
- 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-ESS3-3)
- WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1), (MS-ESS3-4)

Speaking and Listening

- SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-2),

Connections to NJSLS - Mathematics

- MP.2 Reason abstractly and quantitatively. (MS-ESS2-2),
- 6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS3-3), (MS-ESS3-4)
- 7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-ESS3-3), (MS-ESS3-4)
- 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

Computer Science and Design Thinking Practices

8. ✓ Fostering an Inclusive Computing and Design Culture
9. ✓ Collaborating Around Computing and Design
10. ✓ Recognizing and Defining Computational Problems
11. ✓ Developing and Using Abstractions
12. ✓ Creating Computational Artifacts
13. ✓ Testing and Refining Computational Artifacts
14. ✓ Communicating About Computing and Design

Computer Science and Design Thinking Standards

8.1 Computer Science

Impacts of Computing

- Advancements in computing technology can change individuals' behaviors. Society is faced with trade-offs due to the increasing globalization and automation that computing brings
  - 8.1.8.IC.1: Compare the trade-offs associated with computing technologies that affect individuals' everyday activities and career options.
  - 8.1.8.IC.2: Describe issues of bias and accessibility in the design of existing technologies

Data and Analysis

- People use digital devices and tools to automate the collection, use, and transformation of data. The manner in which data is collected and transformed is influenced by the type of digital device(s) available and the intended use of the data.
  - 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
- Computer models can be used to simulate events, examine theories and inferences, or make predictions.
  - 8.1.8.DA.5: Test, analyze, and refine computational models.
  - 8.1.8.DA.6: Analyze climate change computational models and propose refinements.

Algorithms & Programming

- Programmers create variables to store data values of different types and perform appropriate operations on their values.

number in a specified set. (MS-ESS1-2), (MS-ESS1-4), (MS-ESS2-2), (MS-ESS3-1), (MS-ESS3-3), (MS-ESS3-4)

- 7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS2-2), (MS-ESS3-1), (MS-ESS3-3), (MS-ESS3-4)

- 7.EE.B.6 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS1-2), (MS-ESS1-4)

- 8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values.

8.2 Design Thinking

Engineering Design

- Engineering design is a systematic, creative, and iterative process used to address local and global problems. The process includes generating ideas, choosing the best solution, and making, testing, and redesigning models or prototypes.
    - 8.2.8.ED.1: Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
    - 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.
    - 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
    - 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team
- Engineering design requirements and specifications involve making trade-offs between competing requirements and desired design features.
    - 8.2.8.ED.5: Explain the need for optimization in a design process.
    - 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product.
    - 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches)

Interaction of Technology and Humans

- Economic, political, social and cultural aspects of society drive development of new technological products, processes, and systems.
    - 8.2.8.ITH.1: Explain how the development and use of technology influences economic, political, social, and cultural issues.
- Technology interacts with society, sometimes bringing about changes in a society's economy, politics, and culture, and often leading to the creation of new needs and wants. New needs and wants may create strains on local economies and workforces. Improvements in technology are intended to make the completion of tasks easier, safer, and/or more efficient
    - 8.2.8.ITH.2: Compare how technologies have influenced society over time.
    - 8.2.8.ITH.3: Evaluate the impact of sustainability on the development of a designed product or system.

	○ 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. ○ 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. *Nature of Technology* ● Technology advances through the processes of innovation and invention which relies upon the imaginative and inventive nature of people. Sometimes a technology developed for one purpose is adapted to serve other purposes. Engineers use a systematic process of creating or modifying technologies that is fueled and constrained by physical laws, cultural norms, and economic resources. Scientists use systematic investigation to understand the natural world. ○ 8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem. ○ 8.2.8.NT.2: Analyze an existing technological product that has been repurposed for a different function. ○ 8.2.8.NT.3: Examine a system, consider how each part relates to other parts, and redesign it for another purpose. ○ 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. *Effects of Technology on the Natural World* ● Resources need to be utilized wisely to have positive effects on the environment and society. Some technological decisions involve tradeoffs between environmental and economic needs, while others have positive effects for both the economy and environment. ○ 8.2.8.ETW.1: Illustrate how a product is upcycled into a new product and analyze the short- and long-term benefits and costs. ○ 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). ○ 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. ○ 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best. *Ethics and Culture* ● Technological disparities have consequences for public health and prosperity.

	○ 8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies. ○ 8.2.8.EC.2: Examine the effects of ethical and unethical practices in product design and development.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community member and employee.
- Attend to financial well-being.
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity, increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

Career Readiness, Life Literacies and Key Skills Standards

9.1 Personal Financial Literacy

Civic Financial Responsibility

- Individuals can use their talents, resources, and abilities to give back.
  - 9.1.8.CR.2: Compare various ways to give back through strengths, passions, goals, and other personal factors.

Economic and Government Influences

- There are government agencies and policies that affect the financial industry and the broader economy
  - 9.1.8.EG.5: Interpret how changing economic and societal needs influence employment trends and future education.

9.2 Career Awareness, Exploration, Preparation, and Training

Career Awareness and Planning

- Different types of jobs require different knowledge and skills.
  - 9.1.2.CAP.1: Make a list of different types of jobs and describe the skills associated with each job.
- An individual's passions, aptitude and skills can affect his/her employment and earning potential.
  - 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
  - 9.2.5.CAP.2: Identify how you might like to earn an income.
  - 9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
  - 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

- Income and benefits can vary depending on the employer and type of job or career.
    - 9.2.5.CAP.5: Identify various employee benefits, including income, medical, vacation time, and lifestyle benefits provided by different types of jobs and careers.
- An individual's strengths, lifestyle goals, choices, and interests affect employment and income
    - 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest.
    - 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
    - 9.2.8.CAP.4: Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.
- Developing and implementing an action plan is an essential step for achieving one's personal and professional goals
    - 9.2.8.CAP.5: Develop a personal plan with the assistance of an adult mentor that includes information about career areas of interest, goals and an educational plan
- There are variety of resources available to help navigate the career planning process
    - 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.

9.4 Life Literacies and Key Skills

Creativity and Innovation

- Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
    - 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
    - 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3).
    - 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
    - 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.

Critical Thinking and Problem-solving

- Multiple solutions often exist to solve a problem.
    - 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
    - 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1)
- An essential aspect of problem solving is being able to self-reflect on why possible solutions for solving problems were or were not successful.
    - 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.

Digital Citizenship

- Detailed examples exist to illustrate crediting others when incorporating their digital artifacts in one's own work.
    - 9.4.8.DC.1: Analyze the resource citations in online materials for proper use.
    - 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8)
- Digital communities are used by individuals to share information, organize, and engage around issues and topics of interest.
    - 9.4.8.DC.7: Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys.
- Digital technology and data can be leveraged by communities to address effects of climate change.
    - 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).

Global and Cultural Awareness

- Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction
    - 9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).

- 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.

Information and Media Literacy

- Increases in the quantity of information available through electronic means have heightened the need to check sources for possible distortion, exaggeration, or misrepresentation.
  - 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.
  - 9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.
- Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated.
  - 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
  - 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
- The mode of information can convey a message to consumers or an audience.
  - 9.4.8.IML.6: Identify subtle and overt messages based on the method of communication.
- Sources of information are evaluated for accuracy and relevance when considering the use of information.
  - 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b).
- There is a need to produce and publish media that has information supported with quality evidence and is intended for authentic audiences.
  - 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.

Technology Literacy

- Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others
  - 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
  - 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
  - 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.
  - 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MS-LS4-5, 6.1.8.CivicsPI.3).

Climate Change

- **MS-ESS3-3** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- **MS-ESS3-4** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

https://www.nj.gov/education/safety/wellness/selearning/index.shtml

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards. Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: ● Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) ● Exit tickets, rotational activities (stations), quizzes, and small group activities ● Classwork, homework, group work (formative assessment) ● Pre-Assessment, teacher's observation, class discussion, and journal	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* **Benchmark Assessments:** ● Assessment 1.1: Mid-Unit Assessment ● Assessment 1.2: End of Unit Assessment ● Assessment 1.3: End of Unit Performance Assessment **Standardized Assessments:** ● NJSLA **Other Summative Assessments:** Teachers are encouraged to design their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

Natural resources, renewable resources, nonrenewable resources, properties, deposits, extraction, rock, rock strata, sedimentary rock, igneous rock, metamorphic rock, fossils, salts, metals, minerals, fossil fuels, petroleum, oil, gas, freshwater, groundwater, aquifer, consumption, geology, geologists, topographic map, geological features, river, stream, beaches, cliffs, erosion, deposition, weathering, wind, water, geoscience processes, fertilizer, runoff, nutrient, contaminant, dissolve, gravity, substance, matter, water cycle, wetland, soil, vegetation, mitigation

District/School Tasks	District/School Primary and Supplementary Resources
● Common Formative Assessments ● Common District Summative Assessments ● See above Assessment Sections for more information	**District-Mandated Resources** ● Lab-Aides Curriculum **Assessment Resources:** ● Available on Lab-Aides.com ● For additional resources, log in to https://edconnectnj.schoolnet.com **Other Resources:**

	• Generation Genius: "Natural Resource Distribution", "Rocks and Minerals", "Rock Layers (Geologic Time)", "The Fossil Record", "Intro to Climate Change", "Engineering Design Process" • Warm-Up Activities: Amistad Activity, SEL Activity, Holocaust Activity, Climate Change Activity, LGBTQ+/Disabilities • Current Events, Articles: Readworks, Newsela, Scholastic Magazine (Science World) • Simulations, Videos, Games: Scholastic Study Jams, The Science Spot, PBS Learning Media, PhET, Gizmos • Activities, and Lessons: Discovery Education Techbook, Steve Spangler, Kesler Science, Science Buddies, Generation Genius • Youtube Channels (MooMooMath and Science, TedEd, CrashCourse, Sick Science, Teacher's Pet, etc.) • The Importance of Embracing Questions (SEL Resource) • Research famous scientists and possible STEM Careers: Learning for Justice: STEM at Work (Amistad Law Resource) • Rock Cycle Interactive • Geochemical Cycles (ex: Carbon Cycle) (Climate Change Resource) **Project Ideas:** • Researching the future of resources: Where does Lithium (for lithium batteries) come from? • Researching the scientists of today: Who are the people creating these new technologies and materials?
Instructional Best Practices and Exemplars	
See Appendix A for Instructional Best Practices and Exemplars	
Pacing Guide	
Grade 8 Science Pacing Guide	

Unit 3 Evolution: Life and Physical Sciences

Overview

In this unit, the students will study how people can affect and be affected by evolution. Populations change over time. Some changes take place over very long time periods, while others take place over observable time periods. People can cause and be affected by these changes. Examples include: there are more life forms now than there were in the past; some kinds of organisms have gone extinct, like large dinosaurs; organisms that are harmful, like some bacteria and pests, have developed resistance to our methods of eliminating them. In this unit of study, students connect fossil records to evidence of evolution, anatomical similarities of the relationships among organisms and species, and natural selection. Students search for patterns in the evidence to support their understanding of the fossil records, demonstrating how those patterns show relationships between modern organisms and their common ancestors. They will use ideas of genetic variation in a population to make sense of how organisms survive and reproduce, thus passing on the traits of the species. Students generate and answer questions such as: How have populations changed over time? What caused these changes? How are people affected by and affecting evolution? Are people causing a mass extinction?

Essential Questions	Enduring Understandings
Overarching Driving Questions: *How have populations changed over time?* *What caused these changes?* *How are people affected by and affecting evolution?* *Are people causing a mass extinction?* ● How are humans affecting evolution? ● What happens when a person does not take antibiotics as prescribed? (Activity 1) ● How do populations change over time? ● How does the environment affect an individual's probability of survival and successful reproduction? (Activity 2) ● How does natural selection happen? (Activity 3) ● What role does genetic variation play in the process of natural selection? (Activity 4) ● How do mutations affect survival? (Activity 5) ● Why does sickle cell trait frequency vary across the world? (Activity 6) ● What information can we learn from fossils? ● How do new species evolve? (Activity 7) ● How are the diverse species living today related to one another and to the species that once lived on Earth? (Activity 8) ● What kind of evidence do fossils provide about evolution? (Activity 9) ● What other kinds of information can we get from fossils? (Activity 10) ● What can you learn about evolution by comparing the fossil records of fish, mammals, and reptiles? (Activity 11) ● How did whales evolve? (Activity 12)	**Anchoring Phenomenon: Populations change over time** ● Humans can change the way species, including bacteria, look or behave. ● Some bacteria are more resistant to antibiotics than others, and because of that, can become more abundant over time. ● Populations change over time. ● Some traits increase an individual's chance of survival in a specific type of environment. ● Natural selection is the process by which some traits become relatively more common in a population over time. ● Variation in traits is caused by mutations, and mutations are passed on to offspring; the frequency of the trait in the population depends on the environment. ● The sickle cell mutation is harmful when a person has two copies because it affects the structure and function of red blood cells; it is beneficial when a person has one copy in an environment with malaria. ● The frequency of the sickle cell trait depends on two environmental variables—the frequency of malaria and the availability of health care. ● Evidence of species that no longer exist can be found in fossils. ● Natural selection happening over a short period of time leads to changes in trait frequency in a population; when it happens over a long period of time, populations with different traits may evolve into separate species. ● Speciation is a continual process that has resulted in many life forms and billions of species, most of which have gone extinct; all species are related to one another, sharing either a recent or distant ancestor.

• How can embryos provide evidence about evolutionary relationships? (Activity 13) • How are humans affecting evolution? • Is the current rate of extinction typical? (Activity 14) • What is the evidence that resistance to chemical controls is evolving in other types of organisms? (Activity 15) • How have humans manipulated genes in other organisms? (Activity 16) • How are humans affecting and affected by evolution? (Activity 17)	• Fossils provide evidence for evolutionary relationships of organisms that lived in the distant and recent past. • Fossils can also provide information about the habits, traits, and environments of extinct organisms. • Life forms have evolved over time, with some life forms having been relatively more abundant in the past, and other life forms becoming relatively more abundant more recently. • Whales, despite sharing superficial similarities with fish, are aquatic mammals that evolved from terrestrial relatives; this evolutionary history is informed by fossil evidence and evidence from embryos. • Embryos can reveal evolutionary relationships that are not apparent in the adult organisms. • Humans can change the way species look or behave, including bacteria. • People are affecting evolution by causing a significantly higher rate of extinction than in the past. • People are affecting evolution by changing selection pressure on organisms that cause problems for us; the evolutionary responses of these organisms can lead to additional problems for us. • People have manipulated genes and, therefore, evolution of organisms for thousands of years, most recently through genetic engineering. • There are many ways humans are affected by and affecting evolution, and understanding evolution by natural selection is important for understanding and anticipating these processes.

Unit 3 Evolution: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

Students who demonstrate understanding can:

MS-LS3: Heredity: Inheritance and Variation of Traits

- **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 types of mutations.]

MS-LS4: Biological Evolution: Unity and Diversity

- **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

Unit 3 Evolution: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

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 the 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.]

Science and Engineering Practices

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-LS3-1)

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 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)

Unit 3 Evolution: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

- 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.
  - 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 not supported by evidence. (MS-LS4-5)

Disciplinary Core Ideas

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)

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)
- 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)

Crosscutting Concepts

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)

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 and Effect

Unit 3 Evolution: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

- 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 is Based on Empirical Evidence

- Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-1) 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)

Student Learning Objectives

Students will be able to...

- Consider the importance of fossils to earth's geological timeline and the significance that fossil records play in the theory of evolution and natural selection.
- Analyze fossils, explore the role of human impact on earth and contemplate how species change over time due to genetics or become extinct in ever changing environments.
- 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.
- 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.
- Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Integrated Accommodations and Modifications		
Special Education Students	**English Language Learners**	**At Risk**
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed Appendix A: Special Education Accommodations and Modifications	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	504 Plan
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts

• Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments
Interdisciplinary Connections	**Computer Science and Design Thinking**
Connections to NJSLS - English Language Arts *Reading* • 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-LS4-2), (MS-LS4-3), (MS-LS4-4), (MS-LS4-5) • 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), (MS-LS4-1), (MS-LS4-3) • 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-LS4-3), (MS-LS4-4) *Writing* • WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (MS-LS4-2), (MS-LS4-4) • 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-LS4-5) • WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2), (MS-LS4-4) *Speaking and Listening* • Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher led) with diverse partners on grade 6 topics, texts, and issues,	**Computer Science and Design Thinking Practices** 15. ✓ Fostering an Inclusive Computing and Design Culture 16. ✓ Collaborating Around Computing and Design 17. ✓ Recognizing and Defining Computational Problems 18. ✓ Developing and Using Abstractions 19. ✓ Creating Computational Artifacts 20. ✓ Testing and Refining Computational Artifacts 21. ✓ Communicating About Computing and Design Computer Science and Design Thinking Standards **8.1 Computer Science** *Impacts of Computing* • Advancements in computing technology can change individuals' behaviors. Society is faced with trade-offs due to the increasing globalization and automation that computing brings ○ 8.1.8.IC.1: Compare the trade-offs associated with computing technologies that affect individuals' everyday activities and career options. ○ 8.1.8.IC.2: Describe issues of bias and accessibility in the design of existing technologies *Data and Analysis* • People use digital devices and tools to automate the collection, use, and transformation of data. The manner in which data is collected and transformed is influenced by the type of digital device(s) available and the intended use of the data. • 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.

Back to Contents Page

building on others' ideas and expressing their own clearly. (MS-LS4-2), (MS-LS4-4)

- SL.8.4 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. (MS-LS4-2), (MS-LS4-4)
- SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS3-1)

Connections to NJSLS - 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-LS4-4), (MS-LS4-6)
- 6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS4-4), (MS-LS4-6)
- 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-LS4-1), (MS-LS4-2)
- 7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-LS4-4), (MS-LS4-6)

- Computer models can be used to simulate events, examine theories and inferences, or make predictions.
    - 8.1.8.DA.5: Test, analyze, and refine computational models.
    - 8.1.8.DA.6: Analyze climate change computational models and propose refinements.

Algorithms & Programming

- Programmers create variables to store data values of different types and perform appropriate operations on their values.
    - 8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values.

8.2 Design Thinking

Engineering Design

- Engineering design is a systematic, creative, and iterative process used to address local and global problems. The process includes generating ideas, choosing the best solution, and making, testing, and redesigning models or prototypes.
    - 8.2.8.ED.1: Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
    - 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.
    - 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
    - 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team
- Engineering design requirements and specifications involve making trade-offs between competing requirements and desired design features.
    - 8.2.8.ED.5: Explain the need for optimization in a design process.
    - 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product.
    - 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches)

Interaction of Technology and Humans

- Economic, political, social and cultural aspects of society drive development of new technological products, processes, and systems.
    - 8.2.8.ITH.1: Explain how the development and use of technology influences economic, political, social, and cultural issues.

	● Technology interacts with society, sometimes bringing about changes in a society's economy, politics, and culture, and often leading to the creation of new needs and wants. New needs and wants may create strains on local economies and workforces. Improvements in technology are intended to make the completion of tasks easier, safer, and/or more efficient ○ 8.2.8.ITH.2: Compare how technologies have influenced society over time. ○ 8.2.8.ITH.3: Evaluate the impact of sustainability on the development of a designed product or system. ○ 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. ○ 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. *Nature of Technology* ● Technology advances through the processes of innovation and invention which relies upon the imaginative and inventive nature of people. Sometimes a technology developed for one purpose is adapted to serve other purposes. Engineers use a systematic process of creating or modifying technologies that is fueled and constrained by physical laws, cultural norms, and economic resources. Scientists use systematic investigation to understand the natural world. ○ 8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem. ○ 8.2.8.NT.2: Analyze an existing technological product that has been repurposed for a different function. ○ 8.2.8.NT.3: Examine a system, consider how each part relates to other parts, and redesign it for another purpose. ○ 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. *Effects of Technology on the Natural World* ● Resources need to be utilized wisely to have positive effects on the environment and society. Some technological decisions involve tradeoffs between environmental and economic needs, while others have positive effects for both the economy and environment. ○ 8.2.8.ETW.1: Illustrate how a product is upcycled into a new product and analyze the short- and long-term benefits and costs. ○ 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital).

	○ 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. ○ 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best. *Ethics and Culture* ● Technological disparities have consequences for public health and prosperity. ○ 8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies. ○ 8.2.8.EC.2: Examine the effects of ethical and unethical practices in product design and development.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community member and employee.
- Attend to financial well-being.
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity, increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

Career Readiness, Life Literacies and Key Skills Standards

9.1 Personal Financial Literacy

Civic Financial Responsibility

- Individuals can use their talents, resources, and abilities to give back.
  - 9.1.8.CR.2: Compare various ways to give back through strengths, passions, goals, and other personal factors.

Economic and Government Influences

- There are government agencies and policies that affect the financial industry and the broader economy
  - 9.1.8.EG.5: Interpret how changing economic and societal needs influence employment trends and future education.

9.2 Career Awareness, Exploration, Preparation, and Training

Career Awareness and Planning

- Different types of jobs require different knowledge and skills.

- 9.1.2.CAP.1: Make a list of different types of jobs and describe the skills associated with each job.

- An individual's passions, aptitude and skills can affect his/her employment and earning potential.
  - 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
  - 9.2.5.CAP.2: Identify how you might like to earn an income.
  - 9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
  - 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
- Income and benefits can vary depending on the employer and type of job or career.
  - 9.2.5.CAP.5: Identify various employee benefits, including income, medical, vacation time, and lifestyle benefits provided by different types of jobs and careers.
- An individual's strengths, lifestyle goals, choices, and interests affect employment and income
  - 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest.
  - 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
  - 9.2.8.CAP.4: Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.
- Developing and implementing an action plan is an essential step for achieving one's personal and professional goals
  - 9.2.8.CAP.5: Develop a personal plan with the assistance of an adult mentor that includes information about career areas of interest, goals and an educational plan
- There are variety of resources available to help navigate the career planning process
  - 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.

9.4 Life Literacies and Key Skills

Creativity and Innovation

- Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
  - 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
  - 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3).
  - 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
  - 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.

Critical Thinking and Problem-solving

- Multiple solutions often exist to solve a problem.
  - 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
  - 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1)
- An essential aspect of problem solving is being able to self-reflect on why possible solutions for solving problems were or were not successful.
  - 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.

Digital Citizenship

- Detailed examples exist to illustrate crediting others when incorporating their digital artifacts in one's own work.
  - 9.4.8.DC.1: Analyze the resource citations in online materials for proper use.

- 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8)
- Digital communities are used by individuals to share information, organize, and engage around issues and topics of interest.
  - 9.4.8.DC.7: Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys.
- Digital technology and data can be leveraged by communities to address effects of climate change.
  - 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).

Global and Cultural Awareness

- Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction
  - 9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).
  - 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.

Information and Media Literacy

- Increases in the quantity of information available through electronic means have heightened the need to check sources for possible distortion, exaggeration, or misrepresentation.
  - 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.
  - 9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.
- Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated.
  - 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
  - 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
- The mode of information can convey a message to consumers or an audience.
  - 9.4.8.IML.6: Identify subtle and overt messages based on the method of communication.
- Sources of information are evaluated for accuracy and relevance when considering the use of information.
  - 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b).
- There is a need to produce and publish media that has information supported with quality evidence and is intended for authentic audiences.
  - 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.

Technology Literacy

- Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others
  - 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
  - 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
  - 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.
  - 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3).

Climate Change

- **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.

SEL Competencies

- **Self - Awareness**
- **Self - Management**

- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

https://www.nj.gov/education/safety/wellness/selearning/index.shtml

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards. Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: ● Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) ● Exit tickets, rotational activities (stations), quizzes, and small group activities ● Classwork, homework, group work (formative assessment) ● Pre-Assessment, teacher's observation, class discussion, and journal	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* **Benchmark Assessments:** ● Assessment 1.1: Mid-Unit Assessment ● Assessment 1.2: End of Unit Assessment ● Assessment 1.3: End of Unit Performance Assessment **Standardized Assessments:** ● NJSLA **Other Summative Assessments:** Teachers are encouraged to design and their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

Evolution, natural selection, adaptation, population, extinct, mass extinction, pests, bacteria, antibiotics, resistance, survival, genetic variation, mutation, structure, function, fossils, species, speciation, behaviors, traits, fish, mammal, reptile, bird, embryo, anatomy, comparative anatomy, selective breeding, genetic engineering

District/School Tasks	District/School Primary and Supplementary Resources
● Common Formative Assessments ● Common District Summative Assessments ● See above Assessment Sections for more information	**District-Mandated Resources** ● Lab-Aides Curriculum **Assessment Resources:**

- Available on Lab-Aides.com
- For additional resources, log in to https://edconnectnj.schoolnet.com

Other Resources:

- Generation Genius: "The Fossil Record", "Comparative Anatomy", "Classification of Living Things", "Competition in Ecosystems", "Symbiosis", "Natural Selection"
- Warm-Up Activities: Amistad Activity, SEL Activity, Holocaust Activity, Climate Change Activity, LGBTQ+/Disabilities
- Current Events, Articles: Readworks, Newsela, Scholastic Magazine (Science World)
- Simulations, Videos, Games: Scholastic Study Jams, The Science Spot, PBS Learning Media, PhET, Gizmos
- Activities, and Lessons: Discovery Education Techbook, Steve Spangler, Kesler Science, Science Buddies, Generation Genius
- Youtube Channels (MooMooMath and Science, TedEd, CrashCourse, Sick Science, Teacher's Pet, etc.)
- The Importance of Embracing Questions (SEL Resource)
- U.S. Fish and Wildlife Data
- Scientists with Disabilities (Disabilities Awareness Resource)
- Smithsonian Museum
- Museum of Natural History
- Climate Central (Climate Change Resource)
- Peppered Moth Simulation (Climate Change Resource)

Project Ideas:

- Climate Change, Natural Selection, and Adaptation: A Case Study with the Green Crab (Climate Change Resource)

Instructional Best Practices and Exemplars

See Appendix A for Instructional Best Practices and Exemplars

Pacing Guide

Grade 8 Science Pacing Guide

Appendix A: **Instructional Best Practices and Exemplars**

Appendix A: Instructional Best Practices and Exemplars: Unit 1

Appendix A: Instructional Best Practices and Exemplars: Unit 2

Appendix A: Instructional Best Practices and Exemplars: Unit 3

Appendix B:
Exemplars and Explanations

Appendix B: Instructional Exemplars and Explanations: Unit 1

Appendix B: Instructional Exemplars and Explanations: Unit 2

Appendix B: Instructional Exemplars and Explanations: Unit 3

Appendix C:

Classroom Philosophy, Schedule, Structure, and Expectations

Back to Contents Page