Barrington School District | Haddon Heights School District | Lawnside School District | Merchantville School District

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Course Name: Science
Grade: 7

UNIT 1 SUMMARY:

"How is it that everything is made of stardust?"

Students build understandings of what occurs at the atomic and molecular scale. Students apply their understanding that pure substances have characteristic properties and are made from a single type of atom or molecule. They also provide a molecular level accounts to explain states of matter and changes between states. The crosscutting concepts of *cause and effect*, *scale, proportion and quantity*, *structure and function*, *interdependence of science, engineering, and technology*, and *the influence of science, engineering and technology on society and the natural world* provide a framework for understanding the disciplinary core ideas. Students demonstrate grade appropriate proficiency in *developing and using models*, and *obtaining, evaluating, and communicating information*. Students are also expected to use the scientific and engineering practices to demonstrate understanding of the core ideas.

This unit is based on MS-PS1-1 and MS-PS1-2.

Unit 1: Structure and Properties of Matter (20 Days)

ESTABLISHED GOALS	TRANSFER
★ **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. The substructure of atoms and the periodic table are learned in high school chemistry.] [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-PS1-1)** ★ **Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.**	*Students will be able to independently use their knowledge to…* • I can design models to describe the atomic structure of atoms and molecules. • I can analyze data on the properties of substances before and after the substances interact to determine if a chemical or physical reaction has occurred.
	MEANING

[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-PS1-2)**	UNDERSTANDINGS *Students will understand that…* Part A ★ Substances are made from different types of atoms. ★ Atoms are the basic units of matter. ★ Substances combine with one another in various ways. Part B ★ Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. ★ Substances react chemically in characteristic ways. ★ In a chemical process, the atoms that make up the original substances are regrouped into different molecules; these new substances have different properties from those of the reactants. ★ The analysis of data on the properties of products and reactants can be used to determine whether a chemical process has occurred. ★ Density, melting point, boiling point, solubility, flammability, and odor are characteristic properties that can be used to identify a pure substance. ★ Macroscopic patterns are related to the nature of the atomic-level structure of a substance.	ESSENTIAL QUESTIONS ★ ***Part A:*** *If the universe is not made of Legos®, then what is it made of?* ★ **Part B:** *Is it possible to tell if two substances mixed or if they reacted with each other?*

Unit 1: Grade 7- Lessons

Within this unit, students will use informational text and models (which can include student-generated drawings, 3-D ball-and-stick structures, or computer representations) to understand that matter is composed of atoms and molecules. These models should reflect that substances are made from different types of atoms. Student models can be manipulated to show that molecules can be disassembled into their various atoms and reassembled into new substances according to chemical reactions. This scientific knowledge can be used to explain the properties of substances. Students will examine and differentiate between physical and

chemical properties of matter. They are limited to the analysis of the following characteristic properties: density, melting point, boiling point, solubility, flammability, and odor. This analysis of properties serves as evidence to support that chemical reactions of substances cause a rearrangement of atoms to form different molecules.

Students will also recognize that they are using models to observe phenomena too small to be seen. Students who demonstrate this understanding can develop or modify a model of simple molecules to describe the molecules' atomic composition. Examples of molecules that can be modeled include water, oxygen, carbon dioxide, ammonia, and methanol. Additionally, students will develop and modify a model that describes the atomic composition of an extended structure showing a pattern of repeating subunits. Examples may include sodium chloride and diamonds. Due to the repeating subunit patterns, models can include student-generated drawings, 3-D ball-and-stick structures, and computer representations.
Building upon these experiences, students will analyze and interpret data on the properties of substances in order to provide evidence that a chemical reaction has occurred. They will also analyze and interpret data to determine similarities and differences in findings. Students will recognize that macroscopic patterns are related to the nature of microscopic and atomic-level structure. They will use patterns to identify cause-and-effect relationships and graphs and charts to identify patterns in data.

Middle school Chemistry, Chapter 1: Solids, Liquids, and Gases Students are introduced to the idea that matter is composed of atoms and molecules that are attracted to each other and in constant motion. Students explore the attractions and motion of atoms and molecules as they experiment with and observe the heating and cooling of a solid, liquid, and gas.

Middle school Chemistry, Chapter 2: Changes of State Students help design experiments to test whether the temperature of water affects the rate of evaporation and whether the temperature of water vapor affects the rate of condensation. Students also look in more detail at the water molecule to help explain the state changes of water. (all activities/lessons)

States of Matter: Use interactive computer models to trace an atom's trajectory at a certain physical stage, and investigate how molecular behavior is responsible for the substance's state.

Molecular View of a Solid: Explore the structure of a solid at the molecular level. Molecules are always in motion, though molecules in a solid move slowly. All molecules are attracted to each other. Molecules can be weakly or strongly attracted to each other. The way that large molecules interact in physical, chemical and biological applications is a direct consequence of the many tiny attractions of the smaller parts.

Molecular View of a Liquid: Explore the structure of a liquid at the molecular level. Molecules are always in motion. Molecules in a liquid move moderately. All molecules are attracted to each other. Molecules can be weakly or strongly attracted to each other. The way that large molecules interact in physical, chemical and biological applications is a direct consequence of the many tiny attractions of the smaller parts.

Molecular View of a Gas: Explore the structure of a gas at the molecular level. Molecules are always in motion. Molecules in a gas move quickly. All molecules are attracted to each other. Molecules can be weakly or strongly attracted to each other. The way that large molecules interact in physical, chemical and biological applications is a direct consequence of the many tiny attractions of the smaller parts.

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Developing and Using Models · Develop a model to predict and/or describe phenomena. (MS-PS1-1) **Analyzing and Interpreting Data** · Analyze and interpret data to determine similarities and differences in findings. (MS-PS1-2)	**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) ·Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (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) **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)	**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) **Patterns** · Macroscopic patterns are related to the nature of microscopic and atomic-level structure. (MS-PS1-2) - ***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)

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Part A: · 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. *[Boundary: The substructure of atoms and the periodic table are learned in high school chemistry.]* Part B: · 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.	Teacher created tests Individual/Group Presentations Unit projects End of the Unit Writing Project with a rubric End of Unit Test STEAM Labs Models

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.	

Alternative Assessments

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments: Marzano Proficiency Scale **4 - Innovating:** Advanced understanding and application of the standard **3 - Applying:** Consistently applies skills independently **2 - Developing:** Progressing towards independent application of skills **1 - Beginning:** Early stages of development, need assistance	**Suggested Performance Task:** Students with needs alternative assessments ● With a teacher-made rubric, students will create a project (ex: Google Slide) on physical and chemical reactions. Students will show computer generated models of different reactions taking place and what type of reaction it is. Gifted or advanced students alternative assessment ● With a teacher-made rubric, students will create a project (ex: Google Slide) on physical and chemical reactions. Students will show computer generated models and video clips of different reactions taking place and type of reaction. Students will then explain why each example is a good representation of either a physical or chemical reaction by providing at least 2 pieces of evidence and will share with the class.

District/School Texts	District/School Supplementary Resources
Haddon Heights: Life Science (Prentice Hall) **Barrington: N/A** **Lawnside: Science Fusion- The Diversity of Living Things (Houghton Mifflin Harcourt)** M**erchantville: N/A**	Click for link to running resources doc.

Interdisciplinary Connections

ELA	Math	Social Studies
Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.(MS-PS1-2) **RST.6-8.1** 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) **RST.6-8.7**	Reason abstractly and quantitatively. (MS-PS1-1),(MS-PS1-2) **MP.2** Model with mathematics. (MS-PS1-1) **MP.4** Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1),(MS-PS1-2) **6.RP.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) **8.EE.A.3** Display numerical data in plots on a number line, including dot plots, histograms, and box plots. (MS-PS1-2) **6.SP.B.4** Summarize numerical data sets in relation to their context. (MS-PS1-2) **6.SP.B.5**	
21st Century Skills/Career Education	**Technology**	
9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals. 9.2.4.A.2 Identify various life roles and civic and work-related activities in the school, home, and community. 9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career. CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP6. Demonstrate creativity and innovation.	8.2.8.A.2 Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.	

CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.		
Modifications and Accommodations		
Special Education Students small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system · Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. · Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).	**English Language Learners** small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system Provide ELL students with multiple literacy strategies.	**Students at Risk of School Failure** small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system

· Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).		
Gifted and Talented extension project leveled text leadership roles intentional grouping targeted learning from assessment DOK higher order questions Blooms - analyze, evaluate, create	**Students with 504 Plans** small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system	
Unit Duration: Instructional Days		
20 days		

UNIT 2 SUMMARY: Students build understandings of what occurs at the atomic and molecular scale. Students apply their understanding that pure substances have characteristic properties and are made from a single type of atom or molecule. They also provide a molecular level accounts to explain states of matter and changes between states. The crosscutting concepts of cause and effect, scale, proportion and quantity, structure and function, interdependence of science, engineering, and technology, and the influence of science, engineering and technology on society and the natural world provide a framework for understanding the disciplinary core ideas. Students demonstrate grade appropriate proficiency in developing and using models, and obtaining, evaluating, and communicating information. Students are also expected to use the scientific and engineering practices to demonstrate an understanding of the core ideas.
Unit 2: Interactions of Matter

ESTABLISHED GOALS (INDICATOR #)	**TRANSFER (How will this apply to their lives?)**

★ MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
★ 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.

Students will be able to independently use their knowledge to…

★ Gather, read and synthesize information from multiple appropriate sources and describe how they are supported by evidence
★ Develop a model to predict and/or describe phenomena
★ Describe that gases and liquids are made of molecules or inert atoms that are moving and relative to each other
★ Determine that each pure substance has characteristic physical and chemical properties that can be used to identify it

MEANING

UNDERSTANDINGS

Students will understand …

Part A

★ Changes in particle motion, temperature, and state of a pure substance occur when thermal energy is added or removed.
★ Qualitative molecular-level models of solids, liquids, and gases can be used to show that adding or removing thermal energy increases or decreases the kinetic energy of the particles until a change of state occurs.
★ Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.
★ In a liquid, the molecules are constantly in contact with others.
★ In a gas, the molecules 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.
★ The changes of state that occur with variations in temperature or pressure can be described and predicted using models of matter.
★ The term heat as used in everyday language refers both to thermal energy and the transfer of that thermal energy from one object to another.
★ Thermal energy is the motion of atoms or molecules within a substance.
★ In science, heat is used to refer to the

ESSENTIAL QUESTIONS

Part A

★ How can you tell what the molecules are doing in a substance?

Part B

★ How can we trace synthetic materials back to natural ingredients?

	energy transferred due to the temperature difference between two objects. ★ 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 the relationship between the average internal kinetic energy and the potential energy per atom or molecule 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. ★ Cause-and-effect relationships may be used to predict and describe changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed in natural systems. **Part B** ★ Each pure substance has characteristic physical and chemical properties that can be used to identify it. ★ Substances react chemically in characteristic ways. ★ In a chemical process, the atoms that make up the original substances are regrouped into different molecules. ★ New substances that result from chemical processes have different properties from those of the reactants. ★ Natural resources can undergo a chemical process to form synthetic material. ★ Structures can be designed to serve	

	particular functions by taking into account properties of different materials and how materials can be shaped and used. ★ Engineering advances have led to discoveries of important synthetic materials, and scientific discoveries have led to the development of entire industries and engineered systems using these materials. ★ Technology use varies from region to region and over time. ★ The uses of technologies (engineered/synthetic materials) and any limitations on their use are driven by individual or societal needs, desires, and values. ★ The uses of technologies (engineered/synthetic materials) and any limitations on their use are driven by the findings of scientific research and by differences in such factors as climate, natural resources, and economic conditions.	

Unit 2: Grade 7- Lessons

Students will locate information that describes changes in particle motion, changes in temperature, or changes in state as thermal energy is added to or removed from a pure substance. Students will then use models to predict and describe the changes in particle motion, temperature, and state of a pure substance. An example could include the change of state of water from its solid (ice) to liquid and vapor with the addition of thermal energy. Students will come to understand that this process is reversible through the removal of thermal energy, where the pure substance can return from a vapor to a liquid and back to a solid state.

Students who accurately demonstrate understanding will be able to develop qualitative molecular-level models of solids, liquids, and gases to show the cause-and effect relationships of adding or removing thermal energy, which increases or decreases the kinetic energy of the particles until a change of state occurs. Models could include drawings and diagrams.

Students will also need to use mathematics to demonstrate their understanding of the particle motion that is taking place during these changes in state. They will use positive and negative numbers to represent the changes in particle motion and temperature as thermal energy is added or removed. They will then integrate an expression of that same quantitative information in a visual format.

It is important to note that students will need to be responsible for developing the models that they use. It is possible that the teacher could model the process with one type of model and provide opportunities for students to use different types of model to illustrate the same process. After students have a firm understanding of the motion of particles during a phase change, they will be able to move to the next section of this unit. In this portion of the unit of study, students will apply their understanding of particle and chemical change from Unit 1 to make sense of how natural resources react chemically to produce new substances. Students will explain that as a result of the rearrangement of atoms during a chemical process, the synthetic substance has different characteristic properties than the original pure

substance. For example, pure substances like methane, carbon monoxide, and carbon dioxide can be combined chemically to form synthetic fuel. The synthetic fuel would have different characteristic properties than the original pure substances.

Within this unit, students will gather, read, and synthesize qualitative information from multiple sources about the use of natural resources to form synthetic materials and how these new materials affect society. Examples of new materials could include new medicine, foods, and alternative fuels. Some sources could include journals, articles, brochures, or digital media from government publications and/or private industries. Students will cite some of these sources to support the analysis of evidence that these synthetic materials were formed from natural resources and have an impact on society. They will pay special attention to the precise details of explanations or descriptions of how these new substances affect society. Students will also include relevant information from multiple print and digital sources about these impacts. While gathering this information, they will use 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.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information ● 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) **Developing and Using Models** ● Develop a model to predict and/or describe phenomena. (MS-PS1-4)	**PS1.A: Structure and Properties of Matter** ● Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (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) **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) **PS3.A: Definitions of Energy**	**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) **Cause and Effect** ● Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4) *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** ● The uses of technologies and any limitation on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and

	● 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)	economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)
District/School Formative Assessment Plan		**District/School Summative Assessment Plan**
Part A ★ 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. **Part B** ★ 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.		Teacher created tests Individual/Group Presentations Unit projects End of the Unit Writing Project with a rubric End of Unit Test

★ Assess the credibility, accuracy, and possible bias of each publication and methods used within the publication. ★ Describe how information about how synthetic materials formed from natural resources affect society is supported or not supported by evidence	

Alternative Assessments

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments: Marzano Proficiency Scale **4 - Innovating:** Advanced understanding and application of the standard **3 - Applying:** Consistently applies skills independently **2 - Developing:** Progressing towards independent application of skills **1 - Beginning:** Early stages of development, need assistance OR **4 - Innovating:** In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what is expected from the 3.0 goal. **3 - Applying:** *Students will be able to:* - Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.(MS-PS1-3) - 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. (MS-PS1-4) **2 - Developing:** *Students will **recognize** and **recall** specific vocabulary, including:* - Alternative fuel, chemical compound, chemical element, chemical process, impact, natural resource, society, synthetic material. (MS-PS1-3) - Atom, atomic motion, change, change of state, decrease, gas, increase, inert atom,	Suggested Performance Tasks: Part A **Performance Task:** Natural Resources and Synthetic Products In this task, students will select a synthetic product to explore and then create an advertisement, poser, short video, article or other output about their synthetic product answering the following questions: 1. What natural resources are used to make the synthetic product? 2. What chemical processes are used to make the synthetic product? 3. What are the negative and positive impacts to society of making an dusin the synthetic product, compared to making and using a more natural product with a similar function? Part B **Performance Task:** Solar Oven STEAM Project In this task, students will design and build a solar oven with a pool of materials.

kinetic energy, liquid, molecular level, molecular motion, molecule, particle, particle motion, pure substance, solid, state, temperature, thermal energy. (MS-PS1-4) *Students will be able to:* - Describe the chemical process that convert natural resources to new materials and the impacts of synthetic materials on society. (MS-PS1-3) - Describe the changes that occur in particle motion, temperature, and state when thermal energy is added or removed. (MS-PS1-4) **1 - Beginning:** With help, partial success at score 2.0 and 3.0 content.	

District/School Texts	District/School Supplementary Resources
Haddon Heights: Life Science (Prentice Hall) **Barrington: N/A** **Lawnside: Science Fusion- The Diversity of Living Things (Houghton Mifflin Harcourt)** **Merchantville: N/A**	NEWSELA Mosa Mack BrainPop Youtube Quizlet Kahoot Readworks PHET Simulations

Interdisciplinary Connections

ELA	Math	Social Studies
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. 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). 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	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.	6.1.8.C.1.a: Evaluate the impact of science, religion, and technological innovations on European exploration.

plagiarism and following a standard format for citation.		
21st Century Skills/Career Education CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. 9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project. 9.3.12.ED.2 Demonstrate effective oral, written and multimedia communication in multiple formats and contexts. 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice. 9.3.ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance. 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.	**Technology** 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools. 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability. 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory. 8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results	
Modifications and Accommodations		
Special Education Students Small group Direct instruction restate/rephrase graphic organizers modified assignments chunking leveled text intentional grouping read text extended time breaks	**English Language Learners** Labels word banks visuals student friendly definitions extended time chunking intentional grouping	**Students at Risk of School Failure** leveled text graphic organizers modified assignments kinesthetic activities restate/rephrase chunking intentional grouping

Teacher records/ student dictates		
Gifted and Talented extension project leveled text leadership roles intentional grouping Targeted learning from assessment	**Students with 504 Plans** breaks chunking preferential seating visual reminders restate/rephrase check-in/check-out system visual time Teacher records/ student dictates	
Unit Duration: Instructional Days		
20 days		

UNIT 3 SUMMARY:

"How do substances combine or change (react) to make new substances?"

Students provide molecular-level accounts of states of matter and changes between states, of how chemical reactions involve regrouping of atoms to form new substances, and of how atoms rearrange during chemical reactions. Students also apply their understanding of optimization design and process in engineering to chemical reaction systems. The crosscutting concept of *energy and matter* provides a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in developing and using models, analyzing and interpreting data, designing solutions, and obtaining, evaluating, and communicating information. Students are also expected to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Unit 3 Chemical Reactions

ESTABLISHED GOALS	TRANSFER
★ 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. ★ MS-PS1-6: Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. ★ MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be	*Students will be able to independently use their knowledge to…* ★ Use physical models or drawings, including digital forms, to represent atoms in a chemical process. ★ Use mathematical descriptions to show that the number of atoms before and after a chemical process is the same. ★ Undertake a design project, engaging in the design cycle, to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. ★ Analyze and interpret data for the amount, time, and temperature of a substance in testing a device that either releases or absorbs thermal energy by chemical processes to determine similarities and differences in findings. ★ Develop a model to generate data for testing a device that either releases or absorbs thermal energy by chemical processes, including those representing inputs and outputs of thermal energy. ★ Track the transfer of thermal energy as energy flows through a designed system that either releases or absorbs thermal energy by chemical processes.

combined into a new solution to better meet the criteria for success.		
	MEANING	
	UNDERSTANDINGS *Students will understand that…* **Part A** ★ Substances react chemically in characteristic ways. ★ In a chemical process, the atoms that make up the original substances are regrouped into different molecules. ★ New substances created in a chemical process have different properties from those of the reactants. ★ The total number of each type of atom in a chemical process is conserved, and thus the mass does not change (the law of conservation of matter). ★ Matter is conserved because atoms are conserved in physical and chemical processes. ★ The law of conservation of mass is a mathematical description of natural phenomena. **Part B** ★ Some chemical reactions release energy, while others store energy. ★ The transfer of thermal energy can be tracked as energy flows through a designed or natural system. ★ Models of all kinds are important for testing solutions. ★ There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. ★ 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.	ESSENTIAL QUESTIONS **Part A :**What happens to the atoms when I bake a cake? **Part B:** How can a device be designed, constructed, tested, and modified that either releases or absorbs thermal energy by chemical processes?

	★ A solution needs to be tested and then modified on the basis of the test results in order to for it to be improved. ★ 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. ★ Some of the characteristics identified as having the best performance may be incorporated into the new design. .	

Unit 3: Grade 7 - Lessons

Students begin by gaining understanding that substances react chemically in very characteristic ways. To develop this understanding, students will follow precisely a multistep procedure when carrying out experiments that involve chemical reactions that release energy and chemical reactions that absorb energy. As part of their data analysis, students will integrate quantitative information about atoms before and after the chemical reaction. The analysis will include translating written information into information that is expressed in a physical model or drawing or in digital forms. Reasoning both quantitatively and abstractly to communicate their understanding of these reactions, students will model the law of conservation of matter.

They will use ratio and rate to demonstrate that the total number of atoms involved in the chemical reactions does not change and therefore mass is conserved. Within this unit, students will develop a model of the reactions they observe to describe how the total number of atoms does not change in a chemical reaction. Examples of models could include physical models, drawings, or digital forms that represent atoms. Student models ideally should have the ability to be manipulated to represent the rearrangement of reactants to products as a way to demonstrate that matter is conserved during chemical processes. Students will show how their model provides evidence that the law of conservation of matter is a mathematical description of what happens in nature.

In prior units of study, students have learned about the behavior of particles of matter during a change of state and about characteristic chemical and physical properties of matter. This unit will leverage that prior learning by having students undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. For example, students could design a device that releases heat in a way similar to how heat is released when powdered laundry detergent is mixed with water to form a paste. Students will need to be able to track energy transfer as heat energy is either released to the environment or absorbed from the environment. Students could also design a device that absorbs and stores heat from the environment.

The design problem has already been identified; therefore, the emphasis is on designing the device, controlling the transfer of energy to the environment, and modifying the device according to factors such as type and concentration of substance. The criteria for a successful design have not been determined; therefore, teachers will need to work with students to determine criteria for a successful design. Before attempting to determine criteria, students will conduct a short research project to familiarize themselves with scientific information they can use when designing the device. Students must draw on several sources and generate additional focused questions that allow for further avenues of exploration.

After completing their research, students will compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from their reading about the design of the device. Students, with the support of the teacher, will then write design criteria.

Students are now at a point where they can begin the design process. Prior to construction, students should develop a probability model and use it as part of the process for testing their device. They will use the probability model to determine which designs have the greatest probability of success.

It is important that students use mathematics appropriately when analyzing their test results. They must apply properties of operations to calculate numerical data with numbers in any form, convert between forms as appropriate, and assess the reasonableness of answers using mental computations and estimation strategies. Students will collect and analyze these numerical data 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.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Developing and Using Models · Develop a model to describe unobservable mechanisms. (MS-PS1-5) **Constructing Explanations and Designing Solutions** · 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) **Analyzing and Interpreting Data** Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)	**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-PS1-5) · 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) **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*) · There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-3)· Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) **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*	**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) - **Connections to Nature of Science** Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena · Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5)

	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) Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)	

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Part A Use physical models or drawings, including digital forms, to represent atoms in a chemical process. Use mathematical descriptions to show that the number of atoms before and after a chemical process is the same. **Part B** Undertake a design project, engaging in the design cycle, to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. Specific criteria are limited to amount, time, and temperature of a substance. Analyze and interpret data for the amount, time, and temperature of a substance in testing a device that either releases or absorbs thermal energy by chemical processes to determine similarities and differences in findings. Develop a model to generate data for testing a device that either releases or absorbs thermal energy by chemical processes, including those representing inputs and outputs of thermal energy. Track the transfer of thermal energy as energy flows through a designed system that either releases or absorbs thermal energy by chemical processes. Discussions with Peers in Small Groups/Pairs, Turn and talk	Teacher created tests Individual/Group Presentations Unit projects End of the Unit Writing Project with a rubric End of Unit Test

Practice/Homework Strategic, H.O.T. (Higher Order Thinking) Questioning Graphic Organizers Journal Entry/Double Journal Entry Sentence/Paragraph Summaries Anecdotal Notes Self Evaluation Rubrics Comprehension Quizzes, Assessments Vocabulary Assessments/Quizzes Teacher/Student Conferencing Open Ended Questions Oral Assessments Exit tickets	

Alternative Assessments

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Use the following or specific rubric to evaluate students' performance on lesson assessments: Marzano Proficiency Scale **4 - Innovating:** Advanced understanding and application of the standard **3 - Applying:** Consistently applies skills independently **2 - Developing:** Progressing towards independent application of skills **1 - Beginning:** Early stages of development, need assistance OR 4 - **Innovating**: Apply scientific ideas or principles to design an object, tool, process or system. 3 - **Applying**:-Planning and carrying out investigations. 2 - **Developing-**Make inferences from scientific data. 1 - **Beginning-** When two or more different substances are mixed, a new substance with different	**Suggested Performance Task:** ● *Middle School Chemistry*, Chapter 4: Periodic Table and Bonding: (Lesson 1 and 2 only) Students look deeply into the structure of the atom and play a game to better understand the relationship between protons, neutrons, electrons, and energy levels in atoms and their location in the periodic table. Predict how elements will react to each other based on their location in the periodic table. Lesson 1: Students are constructing an explanation of why charges attract or repel. ● *Middle School Chemistry*, Chapter 5: The Water Molecule and Dissolving: Students investigate the polarity of the water molecule and design tests to compare water to less polar liquids for evaporation rate, surface tension, and ability to dissolve certain substances. Students also discover that dissolving applies to solids, liquids, and gases. ● *Middle School Chemistry*, Chapter 6: Chemical Change: Students explore the concept that chemical reactions involve the breaking of certain bonds between atoms in the reactants, and the rearrangement and rebonding of these atoms to make the products. Students also design tests to investigate how the amount of products and the rate of the reaction can be changed. Students will also explore endothermic and exothermic reactions. Students are using models to match what happens during a chemical change and mass is conserved. ● Gumdrop Models: Students will design a model to explain the structure of an atom. This activity will allow for fast pacing for the gifted and talented students. Students will be given Data Cards to develop and modify models of molecules. Content will be differentiated Data Cards will begin with the construction of an atom. As students finish construction, they will draw the atom/molecule as a summative assessment.

properties may be formed.	

District/School Texts	District/School Supplementary Resources
Haddon Heights: Life Science (Prentice Hall) **Barrington: N/A** **Lawnside: Science Fusion- The Diversity of Living Things (Houghton Mifflin Harcourt)** **Merchantville: N/A**	Science News Scholastic News Phet Simulations YouTube Quizlet Mosa Mack Science Arkive Nova Zooniverse Smithsonian Science Ed. Center California Academy of Sciences Nasa Laptops

Interdisciplinary Connections

English Language Arts	Mathematics	Social Studies
RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-3) 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-PS1-5) RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ETS1-3)	MP.2: Reason abstractly and quantitatively. (MS-PS1-5) (MS-ETS1-3) MP.4: Model with mathematics. (MS-PS1-5) 7.EE.3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-3)	6.1.8.C.1.a: Evaluate the impact of science, religion, and technological innovations on European exploration.

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) (MS-ETS1-3) 6.RP.A.3: Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-5)		
21st Century Skills/Career Education CRP2.: Apply appropriate academic and technical skills. CRP4.: Communicate clearly and effectively and with reason. CRP5.: Consider the environmental, social and economic impacts of decisions. CRP6.: Demonstrate creativity and innovation. CRP 7.: Employ valid and reliable research strategies. CRP8.: Utilize critical thinking to make sense of problems and persevere in solving them. CRP11.: Use technology to enhance productivity. CRP12.: Work productively in teams while using cultural global competence. 9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project. 9.3.12.ED.2 Demonstrate effective oral, written and multimedia communication in multiple formats and contexts. 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice. 9.3.ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance. 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.	**Technology** 8.1.8.A.1: Demonstrate knowledge of a real world problem using digital tools. 8.1.8.A.2: Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability. 8.1.8.A.3: Use and/or develop a simulation that provides an environment to solve a real world problem or theory. 8.1.8.D.1 to 5: Digital Citizenship : Students understand human, cultural, societal issues related to technology and practice legal and ethical behavior. - Advocate and practice safe, legal, and responsible use of information and technology. - Demonstrate personal responsibility for lifelong learning. - Exhibit leadership for digital citizenship. 8.1.8.E.1: Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information. - Plan strategies to guide inquiry. - Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.	

	- Evaluate and select information sources and digital tools based on the appropriateness for specific tasks. - Process strategies to guide inquiry.	

Modifications and Accommodations

Special Education Students	**English Language Learners**	**Students at Risk of School Failure**
small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system	small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system TPR Total Physical Response	small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system
Gifted and Talented	**Students with 504 Plans**	
extension project leveled text leadership roles intentional grouping targeted learning from assessment DOK higher order questions Blooms - analyze, evaluate, create	small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities	

	extended time breaks check-in/check-out system	

Unit Duration: Instructional Days
25 days

UNIT 4 SUMMARY: How do cells contribute to the functioning of an organism? Students demonstrate age appropriate abilities to plan and carry out investigations to develop evidence that living organisms are made of cells. Students gather information to support explanations of the relationship between structure and function in cells. They are able to communicate an understanding of cell theory and understand that all organisms are made of cells. Students understand that special structures are responsible for particular functions in organisms. They then are able to use their understanding of cell theory to develop and use physical and conceptual models of cells. The crosscutting concepts of scale, proportion, and quantity and structure and function provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in planning and carrying out investigations, analyzing and interpreting data, and developing and using models, Students are also expected to use these to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Unit 4: Structure and Function

ESTABLISHED GOALS

★ MS-LS1-1: Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

★ MS-LS1-2: Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

TRANSFER

Students will be able to independently use their knowledge to…

★ Investigate that living organisms are made of either one or more cells, and/or different types of cells

★ Demonstrate the function and structure of cells through modeling.

MEANING

UNDERSTANDINGS

Students will understand that…

Part A

★ Distinguish between living and nonliving things.

★ Cells are the smallest unit of life that can be said to be alive.

★ All living things are made up of cells, either one cell or many different numbers and types of cells.

★ Organisms may consist of one single cell (unicellular).

★ Nonliving things can be composed of cells.

★ Organisms may consist of many different numbers and types of cells (multicellular).

ESSENTIAL QUESTIONS

Part A

★ How will astrobiologists know if they have found life elsewhere in the solar system?

Part B

★ How do the functions of cells support an entire organism?

	★ Cells that can be observed at one scale may not be observable at another scale. ★ Engineering advances have led to important discoveries in the field of cell biology, and scientific discoveries have led to the development of entire industries and engineering systems **Part B** ★ The cell functions as a whole system. ★ Identify parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall. ★ Within cells, special structures are responsible for particular functions. ★ Within cells, the cell membrane forms the boundary that controls what enters and leaves the cell. ★ Complex and microscopic structures and systems in cells can be visualized, modeled, and used to describe how the function of the cell depends on the relationships among its parts.	

Unit 4: Grade 7 - Lessons

This unit of study begins with students distinguishing between living and nonliving things. Students will conduct investigations examining both living and nonliving things and using the data they collect as evidence for making this distinction. During this investigation, students will study living things that are made of cells, either one cell or many different numbers and types of cells.

Students will also study nonliving things, some of which are made up of cells. Students will understand that life is a quality that distinguishes living things—composed of living cells—from once-living things that have died or things that never lived. Emphasis is on students beginning to understand the cell theory by developing evidence that living things are made of cells, distinguishing between living and nonliving things, and understanding that living things may be made of one cell or many and varied cells.

Students will pose a question drawn from their investigations and draw on several sources to generate additional related, focused questions that allow for multiple avenues of exploration. They will conduct a short research project to collect evidence to develop and support their answers to the questions they generate. The report created from their research will integrate multimedia and visual displays of cells and specific cell parts into a presentation that will clarify the answers to their questions. Students will include in their reports variables representing two quantities, such as the number of cells that makes up an organism and units representing the size or type of the organism, and their conclusion about the relationship between these two variables. They will write an equation to express one quantity,

thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Students will analyze the relationship between the dependent and independent variables using graphs and tables and relate the graphs and tables to the equation.

As a continuation of their study of the cell, students will study the structure of the cell. This study begins with thinking of the cell as a system that is made up of parts, each of which has a function that contributes to the overall function of the cell. Students will learn that within cells, special structures—such as the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall—are responsible for particular functions. It is important to remember that students are required only to study the functions of these organelles in terms of how they contribute to the overall function of the cell, not in terms of their biochemical functions.

As part of their learning about the structure of the cell, students use models as a way of visualizing and representing structures that are microscopic. Students will develop and use a model to describe the function of the cell as a whole and the ways parts of the cell contribute to the cell's function. Models can be made of a variety of materials, including student-generated drawings, digital representations, or 3-D structures.

Students will examine the structure and function relationship of the cell membrane and the cell wall. They will learn that the structure of the cell membrane makes it possible for it to form the boundary that controls what enters and leaves the cell. They will also learn that the structure of the cell wall makes it possible for it to serve its function. This study of the relationship between structure and function will be limited to the cell wall and cell membrane. Students will use variables to represent two quantities that describe some attribute of at least one structure of the cell—for example, how the surface area of a cell changes in relation to a change Grade 7 Model Science Unit 4: Structure and Function (draft 1.25.16) Instructional Days: 15 4 in the volume cell's volume. Students will write an equation to express the dependent variable in terms of the independent variable, and they will analyze the relationship between the dependent and independent variables using graphs and tables and relate these to the equation.

Throughout this unit, students will learn that some of the structures of the cell are visible when studied under certain magnification while others are and that engineering discoveries are making many new industries possible

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Planning and Carrying Out Investigations • Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1) Developing and Using Models • Develop a model to describe phenomena. (•Conduct an investigation to produce data that provides evidence distinguishing between living and nonliving things. Conduct an investigation to produce data supporting the concept that living things may be made of one cell or many and varied cells. • Distinguish between living and nonliving things. • Observe different types of cells that can be found in the makeup of living things MS-LS1-2)	LS1.A: Structure and Function • All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1) • Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)	Scale, Proportion, and Quantity • Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1) Structure and Function • Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2) 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-LS1-1) •Develop and use a model to describe the function of a cell as a whole. • Develop and use a model to describe how parts of cells contribute to the cell's function. • Develop and use models to describe the relationship between the structure and function of the cell wall and cell membrane.

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Part A Conduct an investigation to produce data that provides evidence distinguishing between living and nonliving things. Conduct an investigation to produce data supporting the concept that living things may be made of one cell or many and varied cells. Distinguish between living and nonliving things. Observe different types of cells that can be found in the makeup of living things. **Part B** Develop and use a model to describe the function of a cell as a whole. Develop and use a model to describe how parts of cells contribute to the cell's function. Develop and use models to describe the relationship between the structure and function of the cell wall and cell membrane. Discussions with Peers in Small Groups/Pairs, Turn and talk Practice/Homework Strategic, H.O.T. (Higher Order Thinking) Questioning Graphic Organizers Journal Entry/Double Journal Entry Sentence/Paragraph Summaries Anecdotal Notes	Teacher created tests Individual/Group Presentations Unit projects End of the Unit Writing Project with a rubric End of Unit Test

Self Evaluation Rubrics Comprehension Quizzes, Assessments Vocabulary Assessments/Quizzes Teacher/Student Conferencing Open Ended Questions Oral Assessments Exit tickets	

Alternative Assessments

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments: Marzano Proficiency Scale **4 - Innovating:** Advanced understanding and application of the standard **3 - Applying:** Consistently applies skills independently **2 - Developing:** Progressing towards independent application of skills **1 - Beginning:** Early stages of development, need assistance **OR** 4 - **Innovating**: In addition to the 3.0 performance score, the student is able to connect these terms and ideas beyond what was taught in the classroom 3 - **Applying**: The student will use specific vocabulary correctly in sentences and explanations (for example: cell, basic unit of life, living, multicellular organism, nonliving, organism, unicellular organism, cell function,prokaryote, eukaryote) • Analyze and interpret the characteristics of prokaryotic and eukaryotic cells including examples of each. • Determine which traits are present in plant cells versus animals cells and which are present in both.	**Suggested Performance Task:** Students with needs alternative assessments Let's Talk Science: Seeding Argumentation About Cells and Growth: This is a sequence of lessons that have been developed to help middle school students learn and argue about the core concept of how a plant root grows at the cellular level. The first part of the sequence begins with a corn seed germination activity and the initial phase of teaching the students argumentation. The second part of the sequence consists of a microscope investigation to provide data upon which students will base their arguments explaining growth at the cellular level. In the third part of the sequence, students use their data to publicly make a claim, and provide evidence and reasoning to support their claims. This sequence unfolds over the course of three weeks Gifted or advanced students alternative assessment Movement of Molecules Into or Out of Cells: Movement of Molecules Into and Out of Cells is one of a series of activities from "Scientific Argumentation in Biology: 30 Classroom Activities. Movement of Molecules engages students in planning and carrying out investigations, modeling, engaging in argument from evidence, and communication. After observing a figure of magnified red blood cells, and a figure of magnified red blood cells with sugar water added, students are presented with a question (Why do the red blood cells appear smaller) and three possible explanations. Based on their chosen explanation and a set of available materials, they design an experiment to test their claim. After engaging in an "Argumentation Session", they write an essay to support their explanation. Teachers are encouraged to refer to the preface, introduction, assessment samples, and appendix provided in the full book for important background on the practice of argumentation and resources for classroom implementation. The standards addressed in the lesson are also included in the teacher's notes. .

2 - **Developing-** The student will recognize or recall specific vocabulary (for example: cell, basic unit of life, living, multicellular organism, nonliving, organism, unicellular organism, cell function, prokaryote, eukaryote) • Describe the characteristics of prokaryotic and eukaryotic cells 1 - **Beginning-** The student will be able to recognize some of the vocabulary for this unit (for example: cell, basic unit of life, living, multicellular organism, nonliving, organism, unicellular organism, cell function, prokaryote, eukaryote) • Recognize examples of prokaryotic and eukaryotic cells.	

District/School Texts	District/School Supplementary Resources
Haddon Heights: Life Science (Prentice Hall) **Barrington: N/A** **Lawnside: Science Fusion- The Diversity of Living Things (Houghton Mifflin Harcourt)** M**erchantville: N/A**	NewsELA BrainPop Scholastic News YouTube Quizlet Kahoot Quizizz Khan Academy Readworks NOVA body + brain: This link will take you to NOVA's homepage for journal articles, videos, and interactives that can be used to teach the body. Animal Communications: All animal species have some capacity for communication but communication abilities range from very simple to extremely complex, depending upon the species. Communication is influenced by a species' genetic makeup, its environment, and the numerous ways by which animals and humans respond to and adapt to their surroundings. USGS Educational Resources for Secondary Grades (7–12): This web site contains selected USGS educational resources that may be useful to educators in secondary school grades. Many of these resources can be used directly in the classroom or will be useful in

		classroom lessons or demonstration activities preparation, or as resources for teacher education and curriculum development. NOAA Education Resources: This website contains access to curriculum resources, professional development opportunities, student opportunities, and outreach
Interdisciplinary Connections		
ELA 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-LS1-1) SL.8.5: Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2)	**Math** 6.EE.C.9: Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1),(MS-LS1-2)	**Social Studies** 6.1.8.C.1.a: Evaluate the impact of science, religion and technological innovations on European explorations
21st Century Skills/Career Education CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. 9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project. 9.3.12.ED.2 Demonstrate effective oral, written and multimedia communication in multiple formats and contexts.	**Technology** 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools. 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability. 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory. 8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results	

9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice. 9.3.ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance. 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.		

Modifications and Accommodations

Special Education Students	**English Language Learners**	**Students at Risk of School Failure**
small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system	small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system TPR Total Physical Response	small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system
Gifted and Talented	**Students with 504 Plans**	
extension project leveled text leadership roles intentional grouping targeted learning from assessment DOK higher order questions Blooms - analyze, evaluate, create	small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks	

	visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system	

Unit Duration: Instructional Days
15 days

UNIT 5 SUMMARY: What are humans made of? Students develop a basic understanding of the role of cells in body systems and how those systems work to support the life functions of the organism. Students will construct explanations for the interactions of systems in cells and organisms. Students understand that special structures are responsible for particular functions in organisms, and that for many organisms, the body is a system of multiple-interaction subsystems that form a hierarchy, from cells to the body. Students construct explanations for the interactions of systems in cells and organisms and for how organisms gather and use information from the environment. The cross-cuttings concepts of systems and system models and cause and effect provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in engaging in argument from evidence and obtaining, evaluating, and communicating information. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Unit 5: Body Systems

ESTABLISHED GOALS

★ Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. (MS-LS1-3)

★ Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. (MS-LS1-8)

TRANSFER

*Students will be able to independently use their knowledge to… (*objectives from standards)*

★ Explain the organization of organisms to support the interaction of various body systems

★ Investigate and analyze the function of the Nervous System

MEANING

UNDERSTANDINGS

Students will understand that…

Part A

★ In multicellular organisms, the body is a system of multiple, interacting subsystems.

★ Subsystems are groups of cells that work together to form tissues.

★ Organs are groups of tissues that work together to perform a particular body function.

★ Tissues and organs are specialized for particular body functions.

ESSENTIAL QUESTIONS

Part A

★ What is the evidence that a body is actually a system of interacting subsystems composed of groups of interacting cells?

Part B

★ How do organisms receive and respond to information from their environment?

	★ Systems may interact with other systems. ★ Systems may have subsystems and be part of larger complex systems. ★ Interactions are limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems. ★ Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. **Part B** ★ Sense receptors respond to different inputs (electromagnetic, mechanical, chemical). ★ Sense receptors transmit responses as signals that travel along nerve cells to the brain. ★ Signals are then processed in the brain. ★ Brain processing results in immediate behaviors or memories. ★ Cause-and-effect relationships may be used to predict response to stimuli in natural systems.	

Unit 5: Grade 7 - Lessons

Lesson topics may include, but are not limited to:

Students will use informational text and models to support their understanding that the body is a system of interacting subsystems. Instruction should begin with students understanding that the cell is a specialized structure that is a functioning system. Students will need to understand that different types of cells have different functions; therefore, each cell system is specialized to perform its particular function. Building on this understanding, students learn that different types of cells serve as subsystems for larger systems called tissues. Groups of specialized tissues serve as subsystems for organs that then serve as subsystems for body systems such as the circulatory, excretory, digestive, respiratory, muscular, and nervous systems. Students need to understand how each body system interacts with other body systems. Emphasis is on the conceptual understanding that each system and subsystem is specialized for particular body functions; it does not include the mechanisms of one body system independent of others.

As part of their investigation of how body systems are interrelated, students should use variables to represent two quantities that describe how the inputs or outputs of one system change in relationship to another.

Students will demonstrate their understanding of this concept by writing an argument, supported by evidence, to support an explanation of how the body is a system of interacting subsystems. As part of their preparation for this written argument, students will read science resources and analyze the evidence used to support

arguments in these resources. While gathering evidence, it is important that students connect to the nature of science by demonstrating scientific habits. They should be sure to display intellectual honesty by ensuring that whenever they cite specific textual information and quote or paraphrase the data and conclusions of others, they avoid plagiarism and provide basic bibliographic information for sources.

Using multiple appropriate sources, students will read and synthesize information and will assess the credibility, accuracy, and possible bias of publications and methods used, and describe how the information they read is or is not supported by evidence

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Obtaining, Evaluating, and Communicating Information 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-LS1-8) **Engaging in Argument from Evidence** Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3)	**LS1.A: Structure and Function** In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3) **LS1.D: Information Processing** Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories (MS-LS1-8)	**Systems and System Models** Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3) **Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1- 8) ***Connections to Nature of Science*** **Science is a Human Endeavor** Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas (MS-LS1-3)

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Part A Use an oral and written argument supported by evidence to support or refute an explanation or a model of how the body is a system of interacting subsystems composed of groups of cells. **Part B** Gather, read, and synthesize information from multiple appropriate sources about sensory receptors' response to stimuli. Assess the credibility, accuracy, and possible bias of each publication and methods used. Describe how publications and methods used are supported or not supported by evidence.	Teacher created tests Individual/Group Presentations Unit projects End of the Unit Writing Project with a rubric End of Unit Test

Alternative Assessments	
Evaluative Criteria	**Assessment Evidence**
Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments: Marzano Proficiency Scale **4 - Innovating:** Advanced understanding and application of the standard **3 - Applying:** Consistently applies skills independently **2 - Developing:** Progressing towards independent application of skills **1 - Beginning:** Early stages of development, need assistance	**Suggested Performance Task:** Students with needs alternative assessments ● Students can find the relationship between increased activity of the muscular system and the related increase in the activity of the circulatory or respiratory system and express this relationship as an equation. They should write the equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable; analyze the relationship using graphs and tables; and relate these to the equation. Gifted or advanced students alternative assessment ● Students will deepen their understanding of subsystems by gathering and synthesizing information about sensory receptors. Students will understand that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. Each sensory receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. Each response can be examined as a cause-and-effect relationship that can be used to predict response to stimuli in natural systems. Each step in the stimulus/response pathway can be connected to students' previous study of systems and subsystems. For example, the nervous system includes receptors that are subsystems that respond to stimuli by sending messages to the brain. ● Students could participate in class discussions in which they can investigate whether information they have read in publications agree with scientific findings or seem to be biased in order to advertise a product or support a position.

District/School Texts	District/School Supplementary Resources
Haddon Heights: Life Science (Prentice Hall) **Barrington: N/A** **Lawnside: Science Fusion- The Diversity of Living Things (Houghton Mifflin Harcourt)** M**erchantville: N/A**	NewsELA BrainPop Scholastic News History Channel YouTube Quizlet Kahoot Quizizz Khan Academy Readworks NOVA body + brain: This link will take you to NOVA's homepage for journal articles, videos, and interactives that can be used to teach the body. Animal Communications: All animal species have some capacity for communication but communication abilities range from very simple to extremely complex, depending upon the species. Communication is influenced by a

	species' genetic makeup, its environment, and the numerous ways by which animals and humans respond to and adapt to their surroundings. USGS Educational Resources for Secondary Grades (7–12): This web site contains selected USGS educational resources that may be useful to educators in secondary school grades. Many of these resources can be used directly in the classroom or will be useful in classroom lessons or demonstration activities preparation, or as resources for teacher education and curriculum development. NOAA Education Resources: This website contains access to curriculum resources, professional development opportunities, student opportunities, and outreach

Interdisciplinary Connections

ELA	**Math**	**Social Studies**
RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-3) RI.6.8 : Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.(MSLS1-3) WHST.6-8.1: Write arguments focused on discipline content. (MS-LS1-3) 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-LS1-8)	N/A	6.1.8.C.1.a: Evaluate the impact of science, religion and technological innovations on European explorations
21st Century Skills/Career Education	**Technology**	
CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason.	8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools. 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers)	

CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. 9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project. 9.3.12.ED.2 Demonstrate effective oral, written and multimedia communication in multiple formats and contexts. 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice. 9.3.ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance. 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.	using one or more digital applications to be critiqued by professionals for usability. 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory. 8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results	

Modifications and Accommodations		
Special Education Students	**English Language Learners**	**Students at Risk of School Failure**
small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system	small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system	small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system

	TPR Total Physical Response	
Gifted and Talented extension project leveled text leadership roles intentional grouping targeted learning from assessment DOK higher order questions Blooms - analyze, evaluate, create	**Students with 504 Plans** small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system	
Unit Duration: Instructional Days		
15 days		

UNIT 6 SUMMARY: Students develop and use models to describe how gene mutations and sexual reproduction contribute to genetic variation. Students understand how genetic factors determine the growth of an individual organism. They also demonstrate understanding of the genetic implications of sexual and asexual reproduction. The crosscutting concepts of cause and effect and structure and function provide a framework for understanding how gene structure determines differences in the functioning of organisms. Students are expected to demonstrate proficiency in developing and using models. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Unit 6: Inheritance and Variation of Traits

ESTABLISHED GOALS (INDICATOR #)	**TRANSFER (How will this apply to their lives?)**	
★ 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. ★ MS-LS3-2: Develop and use a model to describe why asexual reproduction	*Students will be able to independently use their knowledge to…* ★ Develop and use a model to describe phenomena with genetic mutations ★ Differentiate inheritance patterns between asexual and sexual reproduction through modeling.	
	MEANING	
	UNDERSTANDINGS *Students will understand...* **Part A**	ESSENTIAL QUESTIONS **Part A**

results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.	★ Complex and microscopic structures and systems, such as genes located on chromosomes, can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among the parts of the system; therefore, complex natural structures/systems can be analyzed to determine how they function. ★ 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 affect the traits of the individual. ★ In addition to variations that arise from sexual reproduction, genetic information can be altered due to mutations. ★ Some changes to genetic material are beneficial, others harmful, and some neutral to the organism. ★ Changes in genetic material may result in the production of different proteins. ★ Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. ★ 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 ★ Though rare, mutations may result in changes to the structure and function of proteins. **Part B** ★ Organisms reproduce either sexually or asexually and transfer their genetic information to their offspring. ★ Asexual reproduction results in offspring	★ How do structural changes to genes (mutations) located on chromosomes affect proteins or affect the structure and function of an organism? **Part B** ★ How do asexual reproduction and sexual reproduction affect the genetic variation of offspring?

	with identical genetic information. ★ Sexual reproduction results in offspring with genetic variation. ★ Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. ★ In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. ★ Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. ★ Punnett squares, diagrams, and simulations can be used to describe the cause-and-effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.	

Unit 6: Grade 7 - Lessons

Using models, such as electronic simulations, physical models, or drawings, students will learn that genes are located in the chromosomes of cells and each chromosome pair contains two variants of each gene. Students will need to make distinctions between chromosomes and genes and understand the connections between them. DNA will be introduced in high school. Students will learn that chromosomes are the genetic material that is found in the nucleus of the cell and that chromosomes are made up of genes. They will also learn that each gene chiefly controls the production of specific proteins, which in turn affect the traits of the individual

Students should be given opportunities to use student-developed conceptual models to visualize how a mutation of genetic material could have positive, negative, or neutral impact on the expression of traits in organisms. Emphasis in this unit is on conceptual understanding that mutations of the genetic material may result in making different proteins; therefore, models and activities that focus on the expression of genetic traits, rather than on the molecular-level mechanisms for protein synthesis or specific types of mutations, are important for this unit of study. For example, models that assign genetic information to specific segments of model chromosomes could be used. Students could add, remove, or exchange genes located on the chromosomes and see that changing or altering a gene can result in a change in gene expression (proteins and therefore traits).

Students will continue this unit of study by describing two of the most common sources of genetic variation, sexual and asexual reproduction. Students will be able to show that in sexual reproduction, each parent contributes half of the genes acquired by offspring, whereas in asexual reproduction, a single parent contributes the genetic makeup of offspring. Using models such as Punnett squares, diagrams, and simulations, students will describe the cause-and-effect relationship between gene transmission from parents(s) to offspring and the resulting genetic variation. Using symbols to represent the two alleles of a gene, one acquired from each parent, students can use Punnett squares to model how sexual reproduction results in offspring that may or may not have a genetic makeup that is different from either parent. Students can observe the same mixing of genetic information using colored counters or electronic simulations. Using other models, students can show that asexual reproduction results in offspring with the same combination of genetic information as the parents.

Students can summarize the numerical data they collect during these activities as part of their description of why asexual reproduction results in offspring with identical genetic combinations and sexual reproduction results in offspring with genetic variations. As a culmination of this unit of study, students could make multimedia presentations to demonstrate their understanding of the key concepts. Students could participate in a short research project and cite the specific textual evidence used to support the analysis of any scientific information they gather. They could integrate quantitative or technical information as part of their presentation. For example, students can take data collected during investigations of genetic mutations and provide a narrative description of their results. They could use data collected during their investigation of sexual and asexual reproduction. They could also include diagrams, graphs, or tables to clarify their data.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models ● Develop and use a model to describe phenomena. (MS-LS3-1),(MS-LS3-2)	**LS1.B: Growth and Development of Organisms** ● Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2) **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) ● Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2) **LS3.B: Variation of Traits** ● In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)	**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) **Cause and Effect** ● Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3- 2)

	• 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)	

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Part A 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 **Part B** Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information. Develop and use a model to describe why sexual reproduction results in offspring with genetic variation. Use models such as Punnett squares, diagrams, and simulations to describe the cause-and effect-relationship of gene transmission from parent(s) to offspring and resulting genetic variation.	Teacher created tests Individual/Group Presentations Unit projects End of the Unit Writing Project with a rubric End of Unit Test

Alternative Assessments

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments: Marzano Proficiency Scale **4 - Innovating:** Advanced understanding and application of the standard **3 - Applying:** Consistently applies skills independently **2 - Developing:** Progressing towards independent application of skills **1 - Beginning:** Early stages of development, need assistance OR **4 - Innovating:** In addition to score 3.0 performance, the student demonstrates in-depth	Suggested Performance Tasks: Part A **Performance Task:** Informational Project *In this activity students choose a genetic disorder to create an informational piece about. They must address the cause of the genetic disorder (where the genetic mutation has occurred), the effects, symptoms, diagnosis, treatments, and if the mutation is favorable or not. There is also an extension for students to dive deeper to find if gene therapy is applicable to their genetic disorder.* Part B **Performance Task:** Pedigrees and the Inheritance of Lactose Intolerance *In this activity students analyze a family's pedigrees to make a claim based on evidence about mode of inheritance of a lactose intolerance trait, determine the most likely inheritance pattern of a trait, and analyze variations in DNA to make a claim about which variants are associated with specific traits.* **Performance Task:** How do Siamese Cats Get Their Color? *The unit focuses on an essential question: How do Siamese cats develop their coloration? Students develop explanations by making connections among genes, proteins, and traits.*

inferences and applications that go beyond what is expected from the 3.0 goal.

3 - Applying:

Students will be able to:

- 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. (MS-LS3-1)
- Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. (MS-LS3-2)

2 - Developing:

*Students will **recognize** and **recall** specific vocabulary, including:*

- Beneficial, change, chromosome, function, gene, genetic material, harmful, mutation, neutral, organism, protein, structure, trait. (MS-LS3-1)
- Asexual reproduction, cause, effect, gene transmission, genetic, genetic variation, genotype, identical, offspring, parent, Punnett Square, relationship, sexual reproduction, transmission. (MS-LS3-2)

Students will be able to:

- Describe harmful, beneficial, and neutral effects of mutations and the relationship between genes, chromosomes and proteins. (MS-LS3-1)
- Describe sexual and asexual reproduction and use Punnett Squares or other representations to describe possible genotype outcomes. (MS-LS3-2)

1 - Beginning: With help, partial success at score 2.0 and 3.0 content.

District/School Texts	District/School Supplementary Resources
Haddon Heights: Life Science (Prentice Hall) **Barrington: N/A** **Lawnside: Science Fusion- The Diversity of Living Things (Houghton Mifflin Harcourt)**	NEWSELA Mosa Mack BrainPop

Merchantville: N/A		Youtube Quizlet Kahoot Readworks PHET Simulations
Interdisciplinary Connections		
ELA RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. 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. 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). SL.8.5: Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.	**Math** MP.4: Model with mathematics. 6.SP.B.5: Summarize numerical data sets in relation to their context.	**Social Studies** 6.1.8.C.1.a: Evaluate the impact of science, religion and technological innovations on European exploration.
21st Century Skills/Career Education CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. 9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project. 9.3.12.ED.2 Demonstrate effective oral, written and multimedia communication in multiple formats and contexts.	**Technology** 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools. 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability. 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory. 8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results	

9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice. 9.3.ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance. 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.		
Modifications and Accommodations		
Special Education Students Small group Direct instruction Restate/rephrase Graphic organizers Modified assignments Chunking Leveled text Intentional grouping Read text Extended time Breaks Teacher records/ student dictates	**English Language Learners** Labels Word banks Visuals Student friendly definitions Extended time Chunking Intentional grouping	**Students at Risk of School Failure** Leveled text Graphic organizers Modified assignments Kinesthetic activities Restate/rephrase Chunking Intentional grouping
Gifted and Talented Extension project Leveled text Leadership roles Intentional grouping Targeted learning from assessment	**Students with 504 Plans** Breaks Chunking Preferential seating Visual reminders Restate/rephrase Check-in/check-out system Visual time Teacher records/ student dictates	
Unit Duration: Instructional Days		
20 days		

UNIT 7 SUMMARY: ***How do some organisms turn electromagnetic radiation into matter and energy?***

Students provide a mechanistic account for how cells provide a structure for the plant process of photosynthesis in the movement of matter and energy needed for the cell. Students use conceptual and physical models to explain the transfer of energy and cycling of matter as they construct explanations for the role of photosynthesis in cycling matter in ecosystems. They construct scientific explanations for the cycling of matter in organisms and the interactions of organisms to obtain matter and energy from an ecosystem to survive and grow. They understand that sustaining life requires substantial energy and matter inputs, and that the structure and functions of organisms contribute to the capture, transformation, transport, release, and elimination of matter and energy. The crosscutting concepts of *matter and energy* and *structure and function* provide a framework for understanding of the cycling of matter and energy flow into and out of organisms. Students are also expected to demonstrate proficiency in *developing and using models*. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Unit 7: Organization for Matter and Energy Flow in Organisms

ESTABLISHED GOALS	TRANSFER
★ MS-LS1-6: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. ★ MS-LS1-7: Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.	*Students will be able to independently use their knowledge to…* ★ Explain, based on evidence, the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. ★ Develop a model to describe how food is rearranged through chemical reactions to support growth and/or release energy as the matter moves through an organism. **MEANING**

	UNDERSTANDINGS *Students will understand that…* **Part A** ★ Photosynthesis has a role in the cycling of matter and flow of energy into and out of organisms. ★ The flow of energy and cycling of matter can be traced. ★ The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon based organic molecules and release oxygen. ★ Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. ★ Sugars produced by plants can be used immediately or stored for growth or later use. ★ Within a natural system, the transfer of energy drives the motion and/or cycling of matter. **Part B** ★ Food is rearranged through chemical reactions, forming new molecules that support growth. ★ Food is rearranged through chemical reactions, forming new molecules that release energy as this matter moves through an organism. ★ Molecules are broken apart and put back together to form new substances, and in this process, energy is released. ★ Cellular respiration in plants and animals involves chemical reactions with oxygen that release stored energy.	ESSENTIAL QUESTIONS **Part A** ★ What is the role of photosynthesis in the cycling of matter and flow of energy into and out of an organism? **Part B** ★ How is food rearranged through chemical reactions to form new molecules that support growth and/or release energy as this matter moves through an organism?

Unit 7: Grade 7 - Lessons

Students will construct explanations about the role of photosynthesis using evidence obtained from sources, including the students' own experiments or outside sources. Student-constructed informative/explanatory responses will cite specific textual evidence, determine the central ideas to support their analysis, and provide an accurate summary distinct from their own prior knowledge or opinions. Some experiments could include observing elodea releasing oxygen, depriving a plant of sunlight or water, or using glucose test strips. In this unit of study, emphasis is on the transfer of energy that drives the motion and/or cycling of matter.

Students can represent the matter and energy involved in the process of photosynthesis using the equation for this reaction. Using this equation, students can build ball-and-stick models to show how carbon dioxide and water are rearranged to form glucose. Students can also draw conclusions about the cycling of

matter and the flow of energy by observing plants such as elodea. By contrasting elodea plants in a variety of controlled environments, students can draw conclusions about how carbon dioxide and oxygen enter and leave organisms.

Students could also perform investigations where the input of light energy is manipulated. In these investigations, students can observe that even if the matter required for photosynthesis is present, the process will not proceed if light energy is not available. If light is available, students will be able to test the leaves of certain plants for the presence of stored sugar in the form of starch. If light is not available, students will observe that the sugars are not stored as starch in the leaves. This will emphasize that the transfer of light energy drives the cycling of matter into chemical energy. Students can also trace the flow of energy using models such as energy pyramids.

Using the data collected during their investigations and observations of simulations, students construct an explanation for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. They could participate in s short research project in which they will use textual evidence to support their analysis. As part of their research, students will provide an accurate summary of the text they use and determine the central ideas or conclusions of the text. They can they write informative or explanatory texts to explain the process. As a result of their research, students should be able to observe that the information they gather through research supports their scientific observations. They could then make predictions about the impact of different environmental changes on the cycling of matter and flow of energy. For example, students could make predictions about the impact that volcanic eruptions that produce massive clouds of sunlight-blocking ash that linger long periods of time could have on life in the affected area.
Student learning will progress to developing and using models to describe how food is rearranged through chemical reactions. These reactions form new molecules that support growth and/or release energy as the matter moves through an organism. Students can integrate multimedia and visual displays into models to clarify information, strengthen claims and evidence, and add interest. Emphasis is on describing that molecules are broken apart and reassembled and that in this process, energy is released. Student models will demonstrate that matter is conserved in cell respiration. Models can be created using materials similar to those used in students' photosynthesis models, thereby emphasizing the complementary nature of photosynthesis and cellular respiration. Students can also act out the roles of variables within the chemical-reaction rearrangement to deepen their understanding.

Plant Growth and Gas Exchange Unit: This model unit from Michigan State University includes 11 lessons that guide students through the process of collecting evidence and developing explanations of where the dry matter of plants comes from and of the roles of photosynthesis and respiration in the carbon cycle. Along with the focus on building explanations of these core ideas, the unit explicitly integrates the crosscutting concepts of matter and energy and scale, proportion, and quantity. This unit is built around the question of how small seeds grow into large plants, and the core activities of the unit guide students in tracing the mass changes that occur as seeds germinate and grow. These core activities are supported through a carefully planned sequence of learning and assessment activities that follow a research-based learning progression to support the development of student understanding.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Constructing Explanations and Designing Solutions • 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-LS1-6)	**LS1.C: Organization for Matter and Energy Flow in Organisms** · Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6) · Within individual organisms, food moves through a series of chemical reactions in which it is broken down and	**Energy and Matter** · Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1-6) · Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7) - *Connections to Nature of Science*

Developing and Using Models · Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-7)	rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7) **PS3.D: Energy in Chemical Processes and Everyday Life** · The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6) Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)	**Scientific Knowledge is Based on Empirical Evidence** Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6)

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Part A Construct a scientific explanation for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms based on valid and reliable evidence obtained from sources (including the students' own experiments). Construct a scientific explanation for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms 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. **Part B** Develop and use a model to describe how food is rearranged through chemical reactions.	Suggested Assessments: Teacher created tests Individual/Group Presentations Unit projects Project with a rubric End of Unit Test STEAM Labs

Alternative Assessments

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments: Marzano Proficiency Scale **4 - Innovating:** Advanced understanding and application of the standard **3 - Applying:** Consistently applies skills independently	**Suggested Performance Task:** Students with needs alternative assessments ● Utilizing a model (hand made or given depending upon ability) and class-made organizers on photosynthesis, explain the steps for the role of photosynthesis in the cycling of matter and energy flow into and out of an organism. Make a list of food sources. Gifted or advanced students alternative assessment ● Create a food web. Utilizing vocabulary from the unit, explain the steps for the role of photosynthesis in the cycling of matter and energy flow into and out of a system. Using connections from other units and branches in science, apply concepts for how the natural

2 - Developing: Progressing towards independent application of skills **1 - Beginning:** Early stages of development, need assistance	world operates today as it did in the past and will continue to do so in the future.

District/School Texts	**District/School Supplementary Resources**
Haddon Heights: Life Science (Prentice Hall) **Barrington: N/A** **Lawnside: Science Fusion- The Diversity of Living Things (Houghton Mifflin Harcourt)** **Merchantville: N/A**	Click for link to running resources doc.

Interdisciplinary Connections

ELA

RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-6)

RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-6)

WHST.6-8.2: Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS1-6)

WHST.6-8.9Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-6)

Math

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

Social Studies

N/A

21st Century Skills/Career Education

9.1.8.D.5: Explain the economic principle of supply and demand.
9.1.8.E.1: Explain what it means to be a responsible consumer and the factors to consider when making consumer decisions.
9.3.12.AG.2: Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role of agriculture, food and natural resources (AFNR) in society and the economy.

Technology

8.1.8.A.2: Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.
8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results
8.2.8.A.2: Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.
8.2.8.A.3: Investigate a malfunction in any part of a system and identify its impacts.

9.3.12.AG.6: Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources. 9.3.12.ED.5: Demonstrate group collaboration skills to enhance professional education and training practice. 9.3.ST.1: Apply engineering skills in a project that requires project management, process control and quality assurance. 9.3.ST.2: Use technology to acquire, manipulate, analyze and report data. Career Ready Practices CRP1.: Act as a responsible and contributing citizen and employee. CRP2.: Apply appropriate academic and technical skills. CRP4.: Communicate clearly and effectively and with reason. CRP5.: Consider the environmental, social and economic impacts of decisions. CRP6.: Demonstrate creativity and innovation. CRP7.: Employ valid and reliable research strategies. CRP8.: Utilize critical thinking to make sense of problems and persevere in solving them. CRP9.: Model integrity, ethical leadership and effective management. CRP11.: Use technology to enhance productivity. CRP12.: Work productively in teams while using cultural global competence.	8.2.8.A.4:The relationships among technologies and the connections between technology and other fields of study.
Modifications and Accommodations	
Special Education Students small group/intentional grouping preferred seating	**English Language Learners** small group/intentional grouping preferred seating

direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system · Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. · Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). · Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).	direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system Provide ELL students with multiple literacy strategies.
Gifted and Talented extension project leveled text leadership roles intentional grouping targeted learning from assessment DOK higher order questions Blooms - analyze, evaluate, create **Students at Risk of School Failure** small group/intentional grouping	**Students with 504 Plans** small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks

preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system	visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system
Unit Duration: Instructional Days	
15 days	

If no one was there, how do we know the Earth's history?

What provides the forces that drive Earth's systems?

Unit 8 Summary: Students examine geoscience data in order to understand processes and events in Earth's history. Important crosscutting concepts in this unit are *scale, proportion, and quantity*, *stability and change*, and *patterns* in relation to the different ways geologic processes operate over geologic time. An important aspect of the history of Earth is that geologic events and conditions have affected the evolution of life, but different life forms have also played important roles in altering Earth's systems. Students understand how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. Students investigate the controlling properties of important materials and construct explanations based on the analysis of real geoscience data. Students are expected to demonstrate proficiency in *analyzing and interpreting* data and *constructing explanations*. They are also expected to use these practices to demonstrate understanding of the core ideas.

Unit 8: Earth's Systems (30 Days)	
ESTABLISHED GOALS	**TRANSFER**
★ MS-ESS1-4: Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is	*Students will be able to independently use their knowledge to…* ★ Construct a scientific explanation for how the geologic time scale is used to organize Earth's history. ★ Develop a model to describe the earth's cycling of materials and flow of energy that drives the process.

used to organize Earth's 4.6-billion-year-old history.

★ MS-ESS2-1: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

★ MS-ESS2-2: Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

★ MS-ESS2-3: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

★ Apply concepts to explain how geoscience processes have changed Earth's surface at varying time and spatial scales.

★ Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

MEANING

UNDERSTANDINGS

Students will understand that…

Part A

★ The geologic time scale is used to organize Earth's 4.6-billion-year-old history.

★ Rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history.

★ 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.

★ Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Part B

★ Energy drives the process that results in the cycling of Earth's materials.

★ The processes of melting, crystallization, weathering, deformation, and sedimentation act together to form minerals and rocks through the cycling of Earth's materials.

★ All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems.

★ Energy flowing and matter cycling within and among the planet's systems derive from the sun and Earth's hot interior.

★ Energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.

★ Explanations of stability and change in Earth's natural systems can be constructed

ESSENTIAL QUESTIONS

Part A

★ How do we know that the Earth has an approximately 4.6-billion-year-old history?

Part B

★ What drives the cycling of Earth's materials?

Part C

★ Do all of the changes to Earth systems occur in similar time scales?

Part D

★ How is it possible for the same kind of fossils to be found in New Jersey and in Africa?

	by examining the changes over time and processes at different scales, including the atomic scale. **Part C** ★ Geoscience processes have changed Earth's surface at varying time and spatial scales. ★ Processes change Earth's surface at time and spatial scales that can be large or small; many geoscience processes usually behave gradually but are punctuated by catastrophic events. ★ Geoscience processes shape local geographic features. ★ 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. ★ Interactions among Earth's systems have shaped Earth's history and will determine its future. ★ Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. ★ Time, space, and energy phenomena within Earth's systems can be observed at various scales using models to study systems that are too large or too small **Part D** ★ Tectonic processes continually generate new sea floor at ridges and destroy old sea floor at trenches. ★ Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. ★ Patterns in rates of change and other numerical relationships can provide information about past plate motions.	

	★ The distribution of fossils and rocks, continental shapes, and sea floor structures to provide evidence of past plate motions. ★ Similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches) provide evidence of past plate motions.	

Unit 8: Grade 7 - Lessons

Within this unit, students will use the geologic time scale to organize Earth's 4.6-billion-year-old history. They will cite specific textual evidence from science and technical texts to support analysis of rock strata to show how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. They will use analysis of rock formations and the fossils they contain to establish relative ages of major events in Earth's history. Examples of Earth's major events could include the Ice Age or the earliest fossils of Homo sapiens, or the formation of Earth and the earliest evidence of life. Emphasis should be on analyses of rock strata providing only relative dates, not an absolute scale. Students can use variables to represent numbers or quantities and write expressions when solving problems while constructing their explanations. Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.

Students will develop and use models to describe the cycling of Earth materials and the flow of energy that drives this process. This energy comes from the heat of the core of the Earth, which is transferred to the mantle. Convection currents within the mantle then drive the movement of tectonic plates. Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials. Students can generate models to demonstrate the rock cycle, with specific focus on the processes causing change. Students can analyze pictures and rock samples that demonstrate various processes of melting, crystallization, weathering, deformation, and sedimentation.

Students will construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. 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). Further emphasis is on how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Students can gather data and plot volcanoes and earthquakes in order to collect evidence to support the idea that these interactions among Earth's systems have shaped Earth's history and will determine its future. Additional examples can include changes on Earth's surface from weathering and deposition by the movements of water, ice, and wind. Emphasis is also on geoscience processes that shape local geographic features, such as New Jersey's Ridge and Valley Province, Highlands, Piedmont, and Coastal Plain.

Students convey ideas, concepts, and information through the selection, organization, and analysis of relevant content, and they may use multimedia components and visual displays. Students can also compare and contrast the information gained from experiments, simulations, video, or multimedia sources showing evidence of past plate motion with that gained by reading a text on the same topic. They use informative/explanatory texts to examine evidence for how geoscience processes have changed and reason abstractly and quantitatively when analyzing this evidence. They may integrate quantitative or technical information expressed in a flowchart, diagram, model, graph, or table. They can also use variables to represent numbers or quantities and write expressions when solving problems while constructing their explanations.

Students will analyze and interpret data on the distribution of fossils and rocks, and they will look at the continental shapes and sea floor structures to provide evidence of past plate motions. Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. Examples of the data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches). Students may use numerical relationships, symbols, and words while analyzing patterns in rates of change on Earth's crust. Students can use variables to represent numerical data and write expressions or construct simple equations and inequalities when solving a problems involved in the analysis of data about past plate motions. Applying interpreted data on the distribution of fossils and rocks, continental shapes, and sea floor structures, students can provide evidence of past plate motions.

Rock Cycle Journey: This is an activity out of one of the DLESE Teaching boxes. The Teaching Box is titled Mountain Building. This activity is from Lesson 4 Activity #2 called Rock Cycle Journey. Stations are set up to represent different parts of the rock cycle. There is a die at each station. Students begin at one point and roll the die. The students record on their data sheet what happens to them (the rock). The student may end up staying where they are at or going to another station. Students continue individually through a set number of rolls of the dice. Students then look at their data and answer some questions. At the very end they share their information with others.

Interactives-Dynamic Earth: Dynamic Earth is an interactive website where students can learn about the structure of the Earth, the movements of its tectonic plates, as well as the forces that create mountains, valleys, volcanoes and earthquakes. This site consists of four sections with both embedded assessments to check progress and a final summative assessment. Each section explores one aspect of the earth's structure and the movement of its tectonic plates. The instructions are simple and are located on each screen. Students will view animations, read explanations, and use their mouse to drag and drop the earth's continents into the correct places, highlight features on a map and cause earth's tectonic plates to move. At various points, students will check their knowledge by taking a quick quiz or playing a game to see how much they have learned about the Dynamic Earth. This website does have teacher information tabs located as related resources.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Developing and Using Models · Develop and use a model to describe phenomena. (MS-ESS2-1) **Constructing Explanations and Designing Solutions** · Construct a scientific explanation based on	**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)	**Stability and Change** · Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)

valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. (MS-ESS1-4),(MS-ESS2-2) **Analyzing and Interpreting Data** Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3)	**ESS2.A: Earth's Materials and Systems** · All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1) · 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.B: Plate Tectonics and Large-Scale System Interactions** Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)	**Scale Proportion and Quantity** · Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-4),(MS-ESS2-2) **Patterns** · Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3) - *Connections to Nature of Science* **Scientific Knowledge is Open to Revision in Light of New Evidence** Science findings are frequently revised and/or reinterpreted based on new evidence. (MS-ESS2-3)

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Part A 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. **Part B** Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. **Part C** 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).	Suggested Assessments: Teacher created tests Individual/Group Presentations Unit projects Project with a rubric End of Unit Test STEAM Labs

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 at 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 at time and spatial scales that can be 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.

Part D

Analyze and interpret data such as distributions of fossils and rocks, continental shapes, and sea floor 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.

Alternative Assessments

Evaluative Criteria	Assessment Evidence
Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments: Marzano Proficiency Scale **4 - Innovating:** Advanced understanding and application of the standard **3 - Applying:** Consistently applies skills independently **2 - Developing:** Progressing towards independent application of skills **1 - Beginning:** Early stages of development, need assistance	**Suggested Performance Task:** Students with needs alternative assessments • Mountain Building Journal Activities followed by alternate assessment-captions on particular landforms at end of journal pages 34-40 https://web.archive.org/web/20161215155719/http://www.teachingboxes.org/mountainBuilding/lessons/journal/MBJournal.pdf Gifted or advanced students alternative assessment • Mountain Building Journal Activities followed by project with rubric on particular landforms with teacher made rubric including standards from each part of the unit. ie: including component from each formative assessment Parts A-D on landform. (Project in place of journal pages 34-40) https://web.archive.org/web/20161215155719/http://www.teachingboxes.org/mountainBuilding/lessons/journal/MBJournal.pdf

District/School Texts	District/School Supplementary Resources
Haddon Heights: Life Science (Prentice Hall) **Barrington: N/A** **Lawnside: Science Fusion- The Diversity of Living Things (Houghton Mifflin Harcourt)** **Merchantville: N/A**	Click for link to running resources doc.

Interdisciplinary Connections

Technology	Math	Social Studies

RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-4),(MS-ESS2-2) 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) 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-ESS2-3) 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-ESS2-3) SL.8.5: Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-1),(MS-ESS2-2)	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-ESS2-3) 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-ESS1-4),(MS-ESS2-2),(MS-ESS2-3) 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-ESS1-4) MP.2: Reason abstractly and quantitatively. (MS-ESS2-2),(MS-ESS2-3)	6.1.8.C.1.a: Evaluate the impact of science, religion and technological innovations on European exploration.
21st Century Skills/Career Education 9.2.4.A.1: Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals. 9.2.4.A.2: Identify various life roles and civic and work-related activities in the school, home, and community. 9.2.8.B.3: Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career. 9.3.12.AC.6: Read, interpret and use technical drawings, documents and specifications to plan a project.	**Technology** 8.1.8.A.1: Demonstrate knowledge of a real world problem using digital tools. 8.1.8.A.3: Use and/or develop a simulation that provides an environment to solve a real world problem or theory. 8.1.8.A.4: Graph and calculate data within a spreadsheet and present a summary of the results	

9.3.12.ED.5: Demonstrate group collaboration skills to enhance professional education and training practice. CRP1.: Act as a responsible and contributing citizen and employee. CRP2.: Apply appropriate academic and technical skills. CRP4.: Communicate clearly and effectively and with reason. CRP6.: Demonstrate creativity and innovation. CRP7.: Employ valid and reliable research strategies. CRP9.: Model integrity, ethical leadership and effective management. CRP11.: Use technology to enhance productivity.		
Modifications and Accommodations		
Special Education Students small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system · Structure lessons around questions that are authentic, relate to students' interests,	**English Language Learners** small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system Provide ELL students with multiple literacy strategies.	**Students at Risk of School Failure** small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system

social/family background and knowledge of their community. · Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). · Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies). · Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). · Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. · Use project-based science learning to connect science with observable phenomena. · Structure the learning around explaining or solving a social or community-based issue.		
Gifted and Talented extension project leveled text leadership roles intentional grouping targeted learning from assessment DOK higher order questions Blooms - analyze, evaluate, create	**Students with 504 Plans** small group/intentional grouping preferred seating direct instruction provide background knowledge provide individual/small group assistance provide student friendly definitions for vocabulary modified assignments (reduce/revise) provide notes/study guides restate/rephrase graphic organizers, labels, word banks visuals chunking leveled text	

	read text, use audio when available kinesthetic activities extended time breaks check-in/check-out system	
Unit Duration: Instructional Days		
30 days		