Moonachie School District
Science Curriculum:
Grade 7

New Jersey Student Learning Standards for Science

Born On: August 23, 2022
Re-Adopted: August 26, 2025

Unit 1: Overview
[Unit 1: Structure and Properties of Matter](#)
Grade: 7
Content Area: Physical Science
Pacing: 20 Instructional Days
Essential Question
How is it that everything is made of stardust?
Student Learning Objectives (Performance Expectations)
MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.
MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
Unit 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 understanding of the core ideas.
Technical Terms
Electron Cloud model, atoms, molecule, subatomic, nucleus, proton, neutron, electron, particle, electron cloud, isotopes, transmutation, alpha particle, beta particle, atomic scale, molecular scale
Formative Assessment Measures
Part A: If the universe is not made of Legos®, then what is it made of?
Students who understand the concepts are able to: Develop a model of a simple molecule. Use the model of the simple molecule to describe its atomic composition. Develop a model of an extended structure. Use the model of the extended structure to describe its repeating subunits. *[Boundary: The substructure of atoms and the periodic table are learned in high school chemistry.]*
Part B: Is it possible to tell if two substances mixed or if they reacted with each other?
Students who understand the concepts are able to: Analyze and interpret data to determine similarities and differences from results of chemical reactions between substances before and after they undergo a chemical process. Analyze and interpret data on the properties of substances before and after they undergo a chemical process. Identify and describe possible correlation and causation relationships evidenced in chemical reactions. Make logical and conceptual connections between evidence that chemical reactions have occurred and explanations of the properties of substances before and after they undergo a chemical process.

Interdisciplinary Connections	
NJSLS- ELA	**NJSLS- Mathematics**
RL.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what a literary text says explicitly as well as inferences drawn from the text. RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information. W.AW.7.1. Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence. W.IW.7.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content SL.PE.7.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. 7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

Core Instructional Materials	Textbooks Series, Lab Materials, etc.
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.

	9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8). 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b) 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience. 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 9.4.8.TL.3: Select appropriate tools to organize and present information digitally. 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3). 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem. 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.6: Analyze climate change computational models and propose refinements. 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.

	8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.

Modifications				
Multilingual Learners	**Special Education**	**At Risk for School Failure**	**Gifted and Talented**	**504**
Scaffolding Word walls Sentence/paragraph frames Bilingual dictionaries/translation Think alouds Read alouds Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling Cognates	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast	Teacher tutoring Peer tutoring Study guides Graphic organizers Extended time Parent communication Modified assignments Counseling	Curriculum compacting Challenge assignments Enrichment activities Tiered activities Independent research/inquiry Collaborative teamwork Higher level questioning Critical/Analytical thinking tasks Self-directed activities	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast Parent communication Modified assignments

				Counseling

PHYSICAL SCIENCE		
MS. Matter and Its Interactions		
MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.		
Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.		
Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete description of all individual atoms in a complex molecule or extended structure is not required.		
Evidence Statements: MS-PS1-1		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Developing and Using Models Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems. Develop a model to predict and/or describe phenomena.	**PS1.A: Structure and Properties of Matter** Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).	**Scale, Proportion, and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
Connections to other DCIs in this grade-band: MS.ESS2.C		
Articulation of DCIs across grade-bands: 5.PS1.A ; HS.PS1.A ; HS.ESS1.A		

5E Model	
MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.	
Engage Anticipatory Set	What is an Atom? To introduce this topic, have students view the following video. This video will provide a basic introduction into structure of atoms and molecules. http://www.makemegenius.com/science-videos/grade_7/all-about-atoms-and-molecules-for-kids
Exploration Student Inquiry	Have the students work in groups. Each group will be given a different simple molecule. Ex: ammonia, methanol. Research their molecule, find out its composition, identify the type of bond, and uses of the compound. Marshmallow Molecules http://betterlesson.com/lesson/634009/marshmallow-molecules Digital Models: https://phet.colorado.edu/en/simulation/build-a-molecule Research the molecular structure of ammonia and methanol. Using PowerPoint, work in a group to create a digital model of these simple molecules structures.

Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): PS1.A: Structure and Properties of Matter Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1)
Elaboration Extension Activity	Have students create a digital model of a complex, extended structure. Some extended structures the students' research can include: Diamonds, Sugar, Nylon. https://phet.colorado.edu/en/simulation/build-a-molecule
Evaluation Assessment Tasks	Assessment Task A Students will work in groups to develop a model using a digital presentation method (Powerpoint, Google Slides, Prezi, etc...) The models must describe the atomic composition of simple molecules and extended structures. Develop a model to predict and/or describe phenomena.

<table>
<tr><th colspan="3">PHYSICAL SCIENCE</th></tr>
<tr><td colspan="3">MS. Matter and Its Interactions</td></tr>
<tr><td colspan="3">MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.</td></tr>
<tr><td colspan="3">Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.</td></tr>
<tr><td colspan="3">Assessment Boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.</td></tr>
<tr><td colspan="3">Evidence Statements: MS-PS1-2</td></tr>
<tr><th>Science & Engineering Practices</th><th>Disciplinary Core Ideas</th><th>Cross-Cutting Concepts</th></tr>
<tr><td>Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
Analyze and interpret data to determine similarities and differences in findings.
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.</td><td>PS1.A: Structure and Properties of Matter
Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
PS1.B: Chemical Reactions
Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.</td><td>Patterns
Macroscopic patterns are related to the nature of microscopic and atomic-level structure.</td></tr>
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Connections to other DCIs in this grade-band: MS.PS3.D ; MS.LS1.C ; MS.ESS2.A	
Articulation of DCIs across grade-bands: N/	
5E Model	
MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	
Engage Anticipatory Set	Amazing Chemical Reactions: https://www.youtube.com/watch?v=FofPjj7v414 http://betterlesson.com/lesson/634016/chemical-reactions-un-notes
Exploration Student Inquiry	http://www.education.com/science-fair/article/balloon-gas-chemical-reaction/ Students are placed in small groups, and given samples of baking soda and white vinegar. In their groups, they must observe and classify each substance's individual physical properties. Using a graphic organizer, a list of each substance's properties will be collaboratively developed. After the initial investigation, one representative from each student group will share their group's list of physical properties with the whole class. During this time, students from different groups can record additional properties or correct mislabeled properties. The teacher will then briefly explain the exploration activity and appropriate safety procedures to students. Prior to the exploration activity, the teacher may ask the following guiding questions to engage students: · What do you think will happen when baking soda and vinegar come in contact (what will be produced)? · What do you think will happen to the balloon attached? Using the funnel, each student group will add 2 tablespoons of baking soda to each balloon (two people may be needed for this; one person to hold the balloon open and the other person to put the baking soda inside of the balloon). Then the group will pour 4 ounces of vinegar into the bottle. Students will carefully fit the balloon over the bottle opening, and be careful not to drop the baking soda into the vinegar yet. Once the balloon is fitted snugly on the nozzle, students will hold up the balloon and allow the baking soda to fall into the vinegar. Students will observe the chemical reaction and effect on the balloon and record observations/data/visuals in their science journals. Students will respond to the following prompts in their science journals following this exploration activity in words and using pictorial representations: · Which two substances combined? · What happened when the two substances combined? How do you know? · What was formed as a product of the reaction? Explain your reasoning. · Why is this a chemical reaction? Use evidence to support your thinking.
Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): 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-PS1-2)

	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)
Elaboration Extension Activity	Student groups will reassemble and follow the same procedure from the exploration activity. However, the vinegar component will be replaced with a "mystery substance". Each group will receive a different mystery substance (water, hydrogen peroxide) to combine with the baking soda. Following the experiment, students will have to determine whether or not a chemical reaction took place. If time permits, each group of students will research (using online resources) a career in the field of Chemistry in pursuit of the following information: · Briefly describe the purpose of this job. · What are some specific tasks? · What kind of education and experience is required? · Describe the kinds of places that people with this job might work. (For example, in a lab, outside, or in an office?) · In what types of companies do people with this job work? Using this research as a guide, each individual student of the group will create a narrative piece describing a day in the life of a person with that particular profession.
Evaluation Assessment Tasks	Assessment Task A: Analysis & Interpretation of Data Analyze and interpret data to determine similarities and differences in findings. Have students work independently to summarize, in writing, if a chemical reaction has occurred. Students should include evidence based upon observations from exploration activity.

Unit 2: Overview
Unit 2: Interactions of Matter
Grade: 7
Content Area: Physical Science
Pacing: 20 Instructional Days
Essential Question
How can we trace synthetic materials back to natural ingredients?
Student Learning Objectives (Performance Expectations)
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.
Unit 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 understanding of the core ideas.

Technical Terms

Molecular level, thermal energy, radiation, conduction, thermal conductor, thermal insulator, specific heat, thermal contraction, thermal expansion

Formative Assessment Measures

Part A: How can you tell what the molecules are doing in a substance?

Students who understand the concepts are able to:

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

Students who understand the concepts are able to:

Obtain, evaluate, and communicate information to show that synthetic materials come from natural resources and affect society.

Gather, read, and synthesize information about how synthetic materials formed from natural resources affect society.

Assess the credibility, accuracy, and possible bias of each publication and 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.

Interdisciplinary Connections

NJSLS- ELA	NJSLS- Mathematics
RL.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what a literary text says explicitly as well as inferences drawn from the text. RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information. W.AW.7.1. Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language	7.NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers. (Clarification: Computations with rational numbers extend the rules for manipulating fractions to complex fractions)

Arts) to support claims with clear reasons and relevant evidence. W.IW.7.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content SL.PE.7.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly		
Core Instructional Materials	Textbooks Series, Lab Materials, etc.	
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries. 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).	

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Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.6: Analyze climate change computational models and propose refinements. 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.
Modifications	

Multilingual Learners	Special Education	At Risk for School Failure	Gifted and Talented	504
Scaffolding	Word walls	Teacher tutoring	Curriculum compacting	Word walls
Word walls	Visual aides	Peer tutoring	Challenge assignments	Visual aides
Sentence/paragraph frames	Graphic organizers	Study guides	Enrichment activities	Graphic organizers
Bilingual	Multimedia	Graphic organizers	Tiered activities	Multimedia
dictionaries/translation	Leveled readers	Extended time	Independent research/inquiry	Leveled readers
Think alouds	Assistive technology	Parent communication	Collaborative teamwork	Assistive technology
Read alouds	Notes/summaries	Modified assignments	Higher level questioning	Notes/summaries
Highlight key vocabulary	Extended time	Counseling	Critical/Analytical thinking tasks	Extended time
Annotation guides	Answer masking		Self-directed activities	Answer masking
Think-pair- share	Answer eliminator			Answer eliminator
Visual aides	Highlighter			Highlighter
Modeling	Color contrast			Color contrast
Cognates				Parent communication
				Modified assignments
				Counseling

PHYSICAL SCIENCE		
MS. Matter and Its Interactions		
MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.		
Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.		
Assessment Boundary: Assessment is limited to qualitative information.		
Evidence Statements: MS-PS1-3		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods. Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.	**PS1.A: Structure and Properties of Matter** Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. **PS1.B: Chemical Reactions** Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.	**Structure and Function** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. **Connections to Engineering,Technology, and Applications of Science** **Interdependence of Science, Engineering, and Technology** Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. **Influence of Science, Engineering and Technology on Society and the Natural World** The uses of technologies and any limitation on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.
Connections to other DCIs in this grade-band: MS.LS2.A ; MS.LS4.D ; MS.ESS3.A ; MS.ESS3.C		
Articulation of DCIs across grade-bands: HS.PS1.A ; HS.LS2.A ; HS.LS4.D ; HS.ESS3.A		

5E Model	
MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	
Engage Anticipatory Set	Poster paper will be placed around the room. Each poster will have a natural resource as a title Trees, Oil, Soil, Natural Gas. Students will take post-its which includes common materials we use from Earth and place them under the natural resource posted associated with that the production of that material. Use the following graph: Common Materials We Use from Earth https://www.ck12.org/earth-science/Materials-Humans-Use/lesson/Materials-Humans-Use/?referrer=concept_details

Exploration Student Inquiry	Clothing Matters http://www.mineralseducationcoalition.org/pdfs/study/studyoftheearth.pdf https://www.ck12.org/earth-science/Materials-Humans-Use/
Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): 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) 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-PS1-3)
Elaboration Extension Activity	Have students complete additional activities from the following unit: A Study of the Earth's- Natural Resources http://www.mineralseducationcoalition.org/pdfs/study/studyoftheearth.pdf
Evaluation Assessment Tasks	Assessment Task A 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. Students will synthesize the information learned in the lab. Use the following questions to guide the student's written response. Which materials are man-made and which are natural? Analyze the "content" and "care" information. Determine the characteristics of different clothing materials. Why can some be washed in hot water, others only in cold? Why can't some be put in a clothes dryer or ironed? What about bleach? What properties of ber make it attractive for clothing use? Analyze the "content" and "care" information. Determine the characteristics of different clothing materials. Why can some be washed in hot water, others only in cold? Why can't some be put in a clothes dryer or ironed? What about bleach? What effect, if any, does the availability of natural resources have on your life-style? Has the need for resources ever caused war? What causes famine in some countries? Is it lack of food or politics? Has the need for resources ever caused war? What causes famine in some countries? Is it lack of food or politics? Can a country maintain its independence and quality of life without a dependable supply of natural resources? If yes, for how long? If no, what can that country do to continue its existence? Is there anything that isn't made from a natural resource? Have groups of students challenge one another to research something that doesn't come from natural resources.

PHYSICAL SCIENCE		
MS. Matter and Its Interactions		
MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.		
Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawing and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.		
Assessment Boundary: N/A		
Evidence Statements: MS-PS1-4		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Developing and Using Models Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems. Develop a model to predict and/or describe phenomena.	**PS1.A: Structure and Properties of Matter** 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, 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. The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. **PS3.A: Definitions of Energy** The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary) 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)	**Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems.
Connections to other DCIs in this grade-band: MS.ESS2.C		
Articulation of DCIs across grade-bands: HS.PS1.A ; HS.PS1.B ; HS.PS3.A		
NJSLS- ELA: RST.6-8.7		
NJSLS- Math: 6.NS.C.5		
5E Model		

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.	
Engage Anticipatory Set	Introduction Video: States of Matter http://betterlesson.com/lesson/639789/states-of-matter?from=search_lesson_title https://www.youtube.com/watch?v=HAPc6JH85pM
Exploration Student Inquiry	Crack that Marble Lab http://betterlesson.com/lesson/634011/crack-that-marble-properties-of-matter-labs Molecules in Motion (download the Lesson 1.2 PDF to access the lesson plan) http://www.middleschoolchemistry.com/lessonplans/chapter1/lesson2
Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): PS1.A: Structure and Properties of Matter 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, 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. The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. PS3.A: Definitions of Energy The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary) 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)
Elaboration Extension Activity	Determine the melting and freezing points of a substance. Analyze a phase change curve. Students will observe what happens as matter undergoes a phase change. Start with cetyl alcohol in the solid phase well below its melting point. Make observations as heat is added. Keep recording the temperature until the substance is totally melted. Reverse the process and let the same sample cool. (it will cool just sitting out at room temperature with the heat removed.)

	Explain the relationship between temperature and the energy associated with the motion of atoms. Write a hypothesis of what a graph of the temperature changes will look like. Students will graph the results of the temperature changes. A representative from each group will describe each part of the graph using their own words.
Evaluation Assessment Tasks	Assessment Task A: Draw a Model Activity Sheet Develop a model to predict and/or describe phenomena. Students will follow the steps outlined on the Student Activity Sheet. Students should be assessed based upon accuracy of model drawn and analysis of activity using a written response to the guiding questions.

Unit 3: Overview
Unit 3: Chemical Reactions
Grade: 7
Content Area: Physical Science
Pacing: 25 Instructional Days
Essential Question
How do substances combine or change (react) to make new substances?
Student Learning Objectives (Performance Expectations)
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-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
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-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
Unit Summary
Students provide molecular-level accounts of states of matters 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.
Technical Terms
Thermal energy, kinetic molecular theory, conduction, convection, radiation, thermal equilibrium, kelvin, specific heat, calorimeter, thermodynamics, melting point, boiling point, Law of Conservation of Matter, reactants, products, coefficients, subscripts, chemical equations
Formative Assessment Measures

Part A: What happens to the atoms when I bake a cake?
Students who understand the concepts are able 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.
Part B: How can a device be designed, constructed, tested, and modified that either releases or absorbs thermal energy by chemical processes?
Students who understand the concepts are able to: 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.

Interdisciplinary Connections	
NJSLS- ELA	**NJSLS- Mathematics**
RL.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what a literary text says explicitly as well as inferences drawn from the text. RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information. W.AW.7.1. Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence. W.IW.7.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. 7.EE.B.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

SL.PE.7.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly	
Core Instructional Materials	Textbooks Series, Lab Materials, etc.
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries. 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8). 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b) 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience. 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

	9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3). 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.
Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.6: Analyze climate change computational models and propose refinements. 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.

Modifications				
Multilingual Learnerss	**Special Education**	**At Risk for School Failure**	**Gifted and Talented**	**504**
Scaffolding Word walls Sentence/paragraph frames Bilingual dictionaries/translation Think alouds Read alouds	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries	Teacher tutoring Peer tutoring Study guides Graphic organizers Extended time Parent communication Modified assignments	Curriculum compacting Challenge assignments Enrichment activities Tiered activities Independent research/inquiry Collaborative teamwork Higher level questioning	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries

Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling Cognates	Extended time Answer masking Answer eliminator Highlighter Color contrast	Counseling	Critical/Analytical thinking tasks Self-directed activities	Extended time Answer masking Answer eliminator Highlighter Color contrast Parent communication Modified assignments Counseling

<table>
<tr><th colspan="3">PHYSICAL SCIENCE</th></tr>
<tr><td colspan="3">MS. Matter and Its Interactions</td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td colspan="3">Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.</td></tr>
<tr><td colspan="3">Assessment Boundary: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.</td></tr>
<tr><td colspan="3">Evidence Statements: MS-PS1-5</td></tr>
<tr><th>Science & Engineering Practices</th><th>Disciplinary Core Ideas</th><th>Cross-Cutting Concepts</th></tr>
<tr><td>Developing and Using Models
Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.
Develop a model to describe unobservable mechanisms.
Connections to Nature of Science
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena
Laws are regularities or mathematical descriptions of natural phenomena.</td><td>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.
The total number of each type of atom is conserved, and thus the mass does not change.</td><td>Energy and Matter
Matter is conserved because atoms are conserved in physical and chemical processes.</td></tr>
<tr><td colspan="3">Connections to other DCIs in this grade-band: MS.LS1.C ; MS.LS2.B ; MS.ESS2.A</td></tr>
<tr><td colspan="3">Articulation of DCIs across grade-bands: 5.PS1.B ; HS.PS1.B</td></tr>
<tr><th colspan="3">5E Model</th></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td>Engage
Anticipatory Set</td><td colspan="2">What is a Chemical Reaction: Candle Demonstration
The teacher will use a small candle flame to demonstrate a chemical reaction between the candle wax and oxygen in the air.
http://www.middleschoolchemistry.com/lessonplans/chapter6/lesson1
(Complete numbers 1-4)</td></tr>
</table>

Exploration Student Inquiry	Have students view the following video: The Law of Conservation of Mass https://www.youtube.com/watch?v=2S6e11NBwiw What is a Chemical Reaction? http://www.middleschoolchemistry.com/lessonplans/chapter6/lesson1 Students will see a molecular animation of the combustion of methane and oxygen as a model of a similar reaction. Students will use atom model cut-outs to model the reaction and see that all the atoms in the reactants show up in the products. Students will be able to explain that for a chemical reaction to take place, the bonds between atoms in the reactants are broken, the atoms rearrange, and new bonds between the atoms are formed to make the products. Students will also be able to explain that in a chemical reaction, no atoms are created or destroyed.
Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): 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. The total number of each type of atom is conserved, and thus the mass does not change.
Elaboration Extension Activity	Have students create computer-generated models of both experiments using Google slides or another similar application in order to depict how the total number of atoms does not change in a chemical reaction. Labels should be written with details and include the following vocabulary terms: chemical and physical change, reactants, reaction, and law of conservation of mass.
Evaluation Assessment Tasks	Assessment Task A Develop a model to describe unobservable mechanisms. Students will create a model using atom model cut-outs. Teachers should assess the completion of the Student Activity Sheet.

ENGINEERING DESIGN		
MS-ETS1-4 Engineering Design		
MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.		
Evidence Statements: MS-ETS1-4		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.	**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. Models of all kinds are important for testing solutions.	

Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs.	ETS1.C: Optimizing the Design Solution 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.	
Connections to MS-ETS1.B: Developing Possible Solutions Problems include: Physical Science: MS-PS1-6, MS-PS3-3, Life Science: MS-LS2-5		
Connections to MS-ETS1.C: Optimizing the Design Solution include: Physical Science: MS-PS1-6		
Articulation of DCIs across grade-bands: 3-5.ETS1.B ; 3-5.ETS1.C ; HS.ETS1.B ; HS.ETS1.C		

PHYSICAL SCIENCE		
MS. Matter and Its Interactions		
MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.		
Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.		
Assessment Boundary: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device,		
Evidence Statements: MS-PS1-6		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories. Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.	**PS1.B: Chemical Reactions** Some chemical reactions release energy, others store energy. **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) **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) 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)	**Energy and Matter** The transfer of energy can be tracked as energy flows through a designed or natural system.
Connections to other DCIs in this grade-band: MS.PS3.D		
Articulation of DCIs across grade-bands: HS.PS1.A ; HS.PS1.B ; HS.PS3.A ; HS.PS3.B ; HS.PS3.D		
5E Model		
MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.		
Engage	Chemical Reactions and Engineering Design	

Anticipatory Set	http://www.middleschoolchemistry.com/lessonplans/chapter6/lesson11 Using the Student Activity Sheet, take students through the Design the Problem section of the activity. In the story, the eggs need to be moved while they are protected and kept at a specific temperature range. Students observe heat packs that use different chemical processes as possible heat sources for their device. As a class, students identify the features the device should have to be successful (criteria) as well as the factors that might limit or impede the development of a successful design (constraints).
Exploration Student Inquiry	Chemical Reactions and Engineering Design http://www.middleschoolchemistry.com/lessonplans/chapter6/lesson11 Students will design, test, modify, and optimize a device that uses a chemical reaction to reach a specific temperature range for a portable reptile egg incubator. *Note: Students will not be expected to build every element of the heat pack such as incorporating a pouch of water into the pack. Their main goal is to achieve the target temperature range and to design, on paper, the final device.*
Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): PS1.B: Chemical Reactions Some chemical reactions release energy, others store energy. 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) 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) 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)
Elaboration Extension Activity	Related Activities Better Lessons: MS-PS1-6
Evaluation Assessment Tasks	Assessment Task A Students will complete the Reptile Egg Identification Chart. After determining the target temperature range, students use water and different amounts of calcium chloride and baking soda to achieve the right temperature and produce enough gas to support the egg and cushion against impact. Assessment Task B Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.

	Students will design, test, modify, and optimize a device that uses a chemical reaction to reach a specific temperature range for a portable reptile egg incubator. Note: Students will not be expected to build every element of the heat pack such as incorporating a pouch of water into the pack. Their main goal is to achieve the target temperature range and to design, on paper, the final device.

ENGINEERING DESIGN		
MS-ETS1-2 Engineering Design		
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.		
Evidence Statements: MS-ETS1-2		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Engaging in Argument from Evidence	ETS1.B: Developing Possible Solutions	
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.	
Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.		
Connections to MS-ETS1.B: Developing Possible Solutions Problems include: Physical Science: MS-PS1-6, MS-PS3-3, Life Science: MS-LS2-5		
Articulation of DCIs across grade-bands: 3-5.ETS1.A ; 3-5.ETS1.B ; 3-5.ETS1.C ; HS.ETS1.A ; HS.ETS1.B		

ENGINEERING DESIGN		
MS-ETS1-3 Engineering Design		
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.		
Evidence Statements: MS-ETS1-3		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Analyze and interpret data to determine similarities and differences in findings.	**ETS1.B: Developing Possible Solutions** There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. ETS1.C: Optimizing the Design Solution Although one design may not perform the best across all tests, identifying the	

	characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design.	
Connections to MS-ETS1.B: Developing Possible Solutions Problems include: Physical Science: MS-PS1-6, MS-PS3-3, Life Science: MS-LS2-5		
Connections to MS-ETS1.C: Optimizing the Design Solution include: Physical Science: MS-PS1-6		
Articulation of DCIs across grade-bands: 3-5.ETS1.A ; 3-5.ETS1.B ; 3-5.ETS1.C ; HS.ETS1.B ; HS.ETS1.C		

Unit 4: Overview
Unit 4: Structure and Function
Grade: 7
Content Area: Life Science
Pacing: 15 Instructional Days
Essential Question
How do cells contribute to the functioning of an organism?
Student Learning Objectives (Performance Expectations)
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.
Unit Summary
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.
Technical Terms
Cell theory, cell membrane, cytoplasm, cytoskeleton, centriole, chloroplast, eukaryotic, endoplasmic reticulum, prokaryotic, organelle, vacuole, lysosome, lipid bilayer, ribosome, Golgi apparatus, mitochondria, selectively permeable
Formative Assessment Measures
Part A: How will astrobiologists know if they have found life elsewhere in the solar system?
Students who understand the concepts are able to: 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: How do the functions of cells support an entire organism?		
<u>Students who understand the concepts are able to:</u> 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.		
Interdisciplinary Connections		
NJSLS- ELA		**NJSLS- Mathematics**
RL.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what a literary text says explicitly as well as inferences drawn from the text. RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information. W.AW.7.1. Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence. W.IW.7.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content SL.PE.7.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly		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
Core Instructional Materials	Textbooks Series, Lab Materials, etc.	
Career Readiness, Life Literacies and Key Skills		

	9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries. 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8). 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b) 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience. 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 9.4.8.TL.3: Select appropriate tools to organize and present information digitally. 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3). 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.
Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.6: Analyze climate change computational models and propose refinements. 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.

	8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.

Modifications				
Multilingual Learners	**Special Education**	**At Risk for School Failure**	**Gifted and Talented**	**504**
Scaffolding Word walls Sentence/paragraph frames Bilingual dictionaries/translation Think alouds Read alouds Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling Cognates	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast	Teacher tutoring Peer tutoring Study guides Graphic organizers Extended time Parent communication Modified assignments Counseling	Curriculum compacting Challenge assignments Enrichment activities Tiered activities Independent research/inquiry Collaborative teamwork Higher level questioning Critical/Analytical thinking tasks Self-directed activities	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast Parent communication Modified assignments Counseling

LIFE SCIENCE		
MS-LS1-1 From Molecules to Organisms: Structures and Processes		
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.		
Clarification Statement: Emphasis is on 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.		
Assessment Boundary: N/A		
Evidence Statements: MS-LS1-1		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Planning and Carrying Out Investigations Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions. Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.	**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).	**Scale, Proportion, and Quantity** Phenomena that can be observed at one scale may not be observable at another scale. **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.
Connections to other DCIs in this grade-band: N/A		
Articulation of DCIs across grade-bands: HS.LS1.A		

5E Model	
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.	
Engage Anticipatory Set	Is It Alive PowerPoint http://www.curriki.org/xwiki/bin/view/Coll_kfasimpaur/Isitalive Introduction to Cells Video https://vimeo.com/37107992 Interactive Cell Model http://www.cellsalive.com/
Exploration Student Inquiry	Cheek Cell Lab https://docs.google.com/document/d/16ZM9fNEwHrl2wjFBAZj74zC9av0fZTvWr2nDT4mjKzg/edit In this activity, students will: Collect, observe, and describe your own cheek cells Use science equipment and supplies according to instructions Compare stained and unstained cheek cells

	Summarize findings based on observations
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): 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).
Elaboration Extension Activity	Related Activities Better Lessons: LS1-1
Evaluation Assessment Tasks	Assessment Task A: Cheek Cell Lab- Post Reflection Questions Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. 1. How are the three specimens (2 stained and one unstained) alike? 2. How are the three specimens different? 3. What benefit would there be for looking at cells without stain? 4. Was it easier to see the cell structures when they were clumped together or isolated by themselves? Why would that be? 5: What cell structures were you able to view under the microscope? Why were they visible? 6. What cell structures were you NOT able to view? 7. What shape are cheek cells? Is this easy to figure out? Why or why not? 8. List two real-life situations in which looking at cells under a microscope benefits mankind.

LIFE SCIENCE		
MS-LS1-2 From Molecules to Organisms: Structures and Processes		
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.		
Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.		
Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.		
Evidence Statements: MS-LS1-2		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to	**LS1.A: Structure and Function** Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.	**Structure and Function** Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the

describe, test, and predict more abstract phenomena and design systems. Develop and use a model to describe phenomena.		relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.
Connections to other DCIs in this grade-band: MS.LS3.A		
Articulation of DCIs across grade-bands: 4.LS1.A ; HS.LS1.A		

5E Model	
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.	
Engage Anticipatory Set	Parts and Functions of a Cell: http://www.pbslearningmedia.org/asset/tdc02_vid_nucleus/ Parts of a Cell: http://freevideolectures.com/Course/2548/Biology/34
Exploration Student Inquiry	Lesson 1: Make a Cell Model http://sciencenetlinks.com/lessons/cells-1-make-a-model-cell/ Lesson 2: The Cell as a System http://sciencenetlinks.com/lessons/cells-2-the-cell-as-a-system/
Explanation Concepts & Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.A: Structure and Function Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.
Elaboration Extension Activity	Students will compare a cell to a particular system of their choice. Students can choose to compare a cell to a school, sports team, a bicycle or home. They can create a blueprint poster or a 3D model. The model or blueprint will have to showcase their analogy and each of the parts and their functions. The title of your poster will be "A Cell Is Like a…." The poster will actually show your system – NOT the cell. All the parts you include in your poster will be described as part of the system. Student will then explain their cell comparison.
Evaluation Assessment Tasks	Assessment Task A: Make a Cell Model Develop and use a model to describe phenomena. Description: Students should understand the basic functions of the cell structures highlighted in this lesson, as well as have a better understanding of the usefulness and limitations of models. Assess students on their answers to the student sheet as well on their participation in class discussions. Assessment Task B: The Cell as a System- Reflection Questions Students should be able to clearly state why the factory, and more importantly the cell, can be thought of as systems. They should also be able to explain how the individual parts of the cell system operate within the larger context of the cell, and that the processes necessary for life take place within each cell.

	Ask the following questions to assess this understanding, telling students to think about the cell as a system: 1. When this system is working, what does it do? (It produces proteins.) 2. For this system to work, must it receive any input? (Yes; for example, energy ultimately from the sun.) 3. What, if any, output does this system produce? (It produces proteins.) 4. Identify at least four parts of this system. Describe what each part does, and tell how each part contributes to the system as a whole. Can any one part of the system do what the whole system does? Justify your response. (Answers will vary. Students should realize that the organelles need to work together to produce proteins.) 5. Identify at least two parts of this system that must interact if the system is to function. Describe how these parts interact. 6. Can you identify any subsystems within the whole system? (Answers will vary, but students should be able to describe at least one subsystem.) 7. Describe how the functioning of this system would change if one of the parts wears out. 8. In what ways is it useful to think of the cell as a system? (In general, thinking about a cell as a system helps in understanding individual cell organelle functions, and how they operate within the larger context of the cell.)

Unit 5: Overview
Unit 5: Body Systems
Grade: 7
Content Area: Life Science
Pacing: 15 Instructional Days
Essential Question
What are humans made of?
Student Learning Objectives (Performance Expectations)
MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
Unit Summary
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-interacting 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 cutting 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.
Technical Terms

Nervous system, stimuli, neurons, cell body, dendrites, axon, synapse, cerebrum, cerebellum, skeletal system, ligaments, marrow, muscular system, voluntary muscles, involuntary muscles, tendons, circulatory system, plasma, arteries, capillaries, atrium, ventricle, aorta, respiratory system, epiglottis, trachea, alveoli, digestive system, salivary glands, peristaltic, small intestines, pancreas, villi, large intestines
Formative Assessment Measures
Part A: What is the evidence that a body is actually a system of interacting subsystems composed of groups of interacting cells?
Students who understand the concepts are able to: 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: How do organisms receive and respond to information from their environment?
Students who understand the concepts are able to: 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.

Interdisciplinary Connections

NJSLS- ELA	NJSLS- Mathematics
RL.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what a literary text says explicitly as well as inferences drawn from the text. RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information. W.AW.7.1. Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence. W.IW.7.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content	N/A

SL.PE.7.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly	

Core Instructional Materials	Textbooks Series, Lab Materials, etc.
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries. 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8). 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b) 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience. 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 9.4.8.TL.3: Select appropriate tools to organize and present information digitally. 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3). 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.
Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.6: Analyze climate change computational models and propose refinements.

	8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.

Modifications				
Multilingual Learners	**Special Education**	**At Risk for School Failure**	**Gifted and Talented**	**504**
Scaffolding Word walls Sentence/paragraph frames Bilingual dictionaries/translation Think alouds Read alouds Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling Cognates	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast	Teacher tutoring Peer tutoring Study guides Graphic organizers Extended time Parent communication Modified assignments Counseling	Curriculum compacting Challenge assignments Enrichment activities Tiered activities Independent research/inquiry Collaborative teamwork Higher level questioning Critical/Analytical thinking tasks Self-directed activities	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast Parent communication

				Modified assignments Counseling

LIFE SCIENCE		
MS-LS1-3 From Molecules to Organisms: Structures and Processes		
MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.		
Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.		
Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.		
Evidence Statements: MS-LS1-3		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Engaging in Argument from Evidence Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon.	**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.	**Systems and System Models** Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. **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.
Connections to other DCIs in this grade-band: N/A		
Articulation of DCIs across grade-bands: HS.LS1.A		

5E Model	
MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.	
Engage Anticipatory Set	Students will complete a "Pin the organ on the body" game. Hand students an organ of the body. Ask students to identify organ. Then, ask students to put organ in its place on the human body. This can be done via SmartBoard, a physical model, or paper cut-outs. Ask students: What are these organs? Where do they go in the body? http://sciencenetlinks.com/interactives/systems.html. Students will help Arnold find his organs. They will be able to identify the name of organs in different body systems and place them in the body.
Exploration Student Inquiry	Levels of Organization http://utahscience.oremjr.alpine.k12.ut.us/sciber00/7th/cells/sciber/levelorg.htm Start by putting levels of organization on the board (Levels 1-5). Pictures can accompany the words. Put students into groups.

	Research: Put students into groups and assign each group a body system to research. Systems can include: Digestive System, Respiratory System, Skeletal System, Nervous System, Cardiovascular System, Circulatory System, Reproductive System and Muscular system. Students will indicate the role the body system, which organs are within the body system, and how the system interacts with other body systems. Students can use the following website to gather information: http://www.getbodysmart.com/ap/systems/tutorial.html Presentation: Students will conduct a presentation on their body system. Students will create a PowerPoint that presents key information about their system including a list of organs in the system and the functions of these organs. Students should use an oral and written argument that is supported by evidence to explain their system. After all presentations, teacher should lead a class discussion focusing on how all body systems work in conjunction with one another.
Explanation Concepts & Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): 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.
Elaboration Extension Activity	Have students research a disease which affects the body system they presented on. Students can research various aspects of the disease including the causes and its impact on the system.
Evaluation Assessment Tasks	Assessment Task A: Research Presentation Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. Evaluation Criteria- Presentation should include: Key terms Information on major organs within the system Arguments that are supported by evidence Information on how body systems interact with one another

LIFE SCIENCE
MS-LS1-8 From Molecules to Organisms: Structures and Processes
MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
Clarification Statement: N/A
Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.
Evidence Statements: MS-LS1-8

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 6-8 builds on K-5 experiences and progresses to evaluating the merit and validity of ideas and methods. Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.	**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.	**Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural systems.
Connections to other DCIs in this grade-band: N/A		
Articulation of DCIs across grade-bands: 4.LS1.D ; HS.LS1.A		

5E Model	
MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	
Engage Anticipatory Set	Begin class with leading students through an online interactive Stroop Test: https://faculty.washington.edu/chudler/java/ready.html The test will show words written in various colors. Students will have to read words of colors and also try to read the color of the words. Any type of Stroop test can be conducted. http://brainu.org/do-stroop http://www.brainfacts.org/Sensing-Thinking-Behaving/Senses-and-Perception/Articles/2013/A-Mind-About-Touch
Exploration Student Inquiry	Reaction Time Lab In this experiment students will test each other’s reaction times. Lab activities will assess visual, auditory and tactile stimuli. http://wiki.backyardbrains.com/Reaction_Time
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): 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.
Elaboration Extension Activity	Sensory Flowchart Students will be able to connect how nerve receptors and senses can send messages to the brain. Students will be able to summarize the connection, create a flow chart that connects the concepts.
Evaluation Assessment Tasks	Assessment A: Lab Reflection 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.

	Students will synthesize the information learned in the lab to respond to the following questions and tasks. Why do you think touch and audio stimuli have a faster reaction time on average? Do your results match the averages mentioned above? Would you expect a difference in the average reaction times between a male and female? What about a more athletic person compared to a more sedentary person? Do you think it's OK to average two people like we did? What might be the problem? Why did we not test the "tactile" reaction time in the choice task? How could you redesign the experimental setup to test tactile reaction times in the choice task? As you know, you have a dominant vs. a non-dominant hand. With only four trials, it is too hard to see a difference. Perhaps you should repeat the experiment 10-20 times to see if there is any difference between dominant and nondominant hands. The average conduction velocity speed is approximately 20-80 m/s. It takes approximately 1 ms for a neurotransmitter to cross the synapses. Calculate the lower limit for your patella reflex vs. the patellar reflex of a giraffe.

Unit 6: Overview
Unit 6: Inheritance and Variation of Traits
Grade: 7
Content Area: Life Science
Pacing: 20 Instructional Days
Essential Question
Why do kids look similar to their parents?
Student Learning Objectives (Performance Expectations)
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 results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
Unit 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.
Technical Terms
Allele, crossing over, diploid, dominant, egg, fertilization, gamete, genetic recombination, genotype, haploid, heredity, heterozygous, homozygous, hybrid, Law of Independent Assortment, Law of Segregation, meiosis, nondisjunction, phenotype, pollination, recessive, reproduction, zygote

Formative Assessment Measures
Part A: How do structural changes to genes (mutations) located on chromosomes affect proteins or affect the structure and function of an organism?
<u>Students who understand the concepts are able to:</u> 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: How do asexual reproduction and sexual reproduction affect the genetic variation of offspring?
<u>Students who understand the concepts are able to:</u> 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.

Interdisciplinary Connections	
NJSLS- ELA	**NJSLS- Mathematics**
RL.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what a literary text says explicitly as well as inferences drawn from the text. RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information. W.AW.7.1. Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence. W.IW.7.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content SL.PE.7.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with	N/A

diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly SL.II.7.2. Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study		
Core Instructional Materials	Textbooks Series, Lab Materials, etc.	
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries. 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8). 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b) 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience. 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making	

	9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 9.4.8.TL.3: Select appropriate tools to organize and present information digitally. 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3). 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.
Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.6: Analyze climate change computational models and propose refinements. 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.

Modifications				
Multilingual Learners	**Special Education**	**At Risk for School Failure**	**Gifted and Talented**	**504**
Scaffolding Word walls Sentence/paragraph frames Bilingual dictionaries/translation	Word walls Visual aides Graphic organizers Multimedia Leveled readers	Teacher tutoring Peer tutoring Study guides Graphic organizers Extended time	Curriculum compacting Challenge assignments Enrichment activities Tiered activities Independent research/inquiry	Word walls Visual aides Graphic organizers Multimedia Leveled readers

Think alouds Read alouds Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling Cognates	Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast	Parent communication Modified assignments Counseling	Collaborative teamwork Higher level questioning Critical/Analytical thinking tasks Self-directed activities	Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast Parent communication Modified assignments Counseling

LIFE SCIENCE		
MS-LS3-1 Heredity: Inheritance and Variation of Traits		
MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.		
Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.		
Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.		
Evidence Statements: MS-LS3-1		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop and use a model to describe phenomena.	**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. **LS3.B: Variation of Traits** In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.	**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.
Connections to other DCIs in this grade-band: MS.LS1.A ; MS.LS4.A		
Articulation of DCIs across grade-bands: 3.LS3.A ; 3.LS3.B ; HS.LS1.A ; HS.LS1.B ; HS.LS3.A ; HS.LS3.B		
5E Model		
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.		
Engage	Video and Discussion	

Anticipatory Set	Watch an embryo develop in this animation and study how mutations affect the expression of genes. http://www.ck12.org/life-science/Mutations-in-Life-Science/web/Regulating-Genes/
Exploration Student Inquiry	https://www.brainpop.com/health/geneticsgrowthanddevelopment/geneticmutations/preview.weml Video: Introduction to Chromosomes http://www.ck12.org/biology/Chromosomes/lecture/Chromosomes/?referrer=featured_content DNA Replication: Paper Clip Activity http://gpschools.schoolwires.net/cms/lib05/MI01000971/Centricity/Domain/2027/dnareplicationpaperclipactivity.pdf
Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS3.A: Inheritance of Traits Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. LS3.B: Variation of Traits In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.
Elaboration Extension Activity	Genetic Disorder Project: Problem: You are a researcher and you are ready to present information on a genetic disorder you have discovered. You want to get more funding in order to continue your research. Your job is to creatively present all of your findings to the Board of Directors. Your presentation needs to be in words in which all members of the Board of Directors can understand. (In other words – break down all the medical language into everyday speech, whenever possible…) The following website can be used as your main source of information: www.ghr.nlm.nih.gov. Choice of two different projects: 1. Create and present a PowerPoint presentation of the genetic disorder. 2. Create a tissue box display that explains the genetic disorder Both projects must include the following criteria: - Facts or theories about the disorder - Symptoms of the disorder - Inheritance (which chromosome/gene is affected? How do you get it and can it be passed on to further generations? - Incidence (how often it occurs in male/female, ethnicity, age, etc…) - Treatment of the disorder (therapy, medicines, future prospects)

Evaluation Assessment Tasks	Assessment Task A: Paper-Clip Activity: Response Questions Students will respond to questions following Steps 6 & 7 in the Biology DNA Replication: Paper Clip Activity. Assessment Task B: Genetic Disorder Project Projects must meet established criteria.

LIFE SCIENCE

MS-LS3-2 Heredity: Inheritance and Variation of Traits

MS-LS3-2. 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.

Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parents) to offspring and resulting genetic variation.

Assessment Boundary: N/A

Evidence Statements: MS-LS3-2

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop and use a model to describe phenomena.	**LS1.B: Growth and Development of Organisms** LS1.B: Growth and Development of Organisms Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary) **LS3.A: Inheritance of Traits** Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. **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.	**Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural systems.

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

Articulation of DCIs across grade-bands: 3.LS3.A ; 3.LS3.B ; HS.LS1.B ; HS.LS3.A ; HS.LS3.B

5E Model

MS-LS3-2. 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.

Engage Anticipatory Set	https://www.brainpop.com/science/cellularlifeandgenetics/asexualreproduction/preview.weml http://learn.genetics.utah.edu/content/variation/reproduction/

	https://www.youtube.com/watch?v=jk2RJm5RBEk
Exploration Student Inquiry	Mitosis Claymation Videos http://betterlesson.com/lesson/639821/mitosis-claymation-videos Monster Factory In this lesson, students will focus on the big idea that traits are inherited. Students will simulate the inheritance of alleles for physical traits and use those traits to create monster offspring. http://betterlesson.com/lesson/633980/monster-factory Punnett and the Rules Students will be able to set-up and complete a Punnett Square. http://betterlesson.com/lesson/635051/punnett-and-the-rules
Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.B: Growth and Development of Organisms Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary) LS3.A: Inheritance of Traits Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. 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.
Elaboration Extension Activity	Related Activities (Go to MS-LS3-2 section of page) http://www.ck12.org/ngss/middle-school-life-sciences/heredity:-inheritance-and-variation-of-traits
Evaluation Assessment Tasks	Assessment Task A: Mitosis Video Develop and use a model to describe phenomena Teacher will assess student videos according to pre-established criteria. Assessment Task B: Punnett Practice Develop and use a model to describe phenomena http://betterlesson.com/lesson/resource/3174264/punnett-practice Students will use the Punnett Square model that they created for their to describe why genetic variation occurs in offspring of sexual reproduction. Assessment Task C: Model Comparison

	After creating models of both asexual and sexual reproduction, students will draft a written explanation to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

Unit 7: Overview
Unit 7: Organization for Matter and Energy Flow in Organisms
Grade: 7
Content Area: Life Science
Pacing: 15 Instructional Days
Essential Question
How do some organisms turn electromagnetic radiation into matter and energy?
Student Learning Objectives (Performance Expectations)
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.
Unit Summary
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.
Technical Terms
Sepals, petals, stamen, filament, anther, pistil, stigma, style, ovary, ovule, angiosperm, gymnosperm, pollination, fertilization, egg cell, sperm cell, zygote, embryo, dormancy, germination, photosynthesis, heterotrophic, light reactions, chloroplast, thylakoid, granum, stroma, visible spectrum of light, ATP synthase, Calvin cycle, carbon fixation
Formative Assessment Measures
Part A: What is the role of photosynthesis in the cycling of matter and flow of energy into and out of an organism?
Students who understand the concepts are able to: 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: 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?
Students who understand the concepts are able to: Develop and use a model to describe how food is rearranged through chemical reactions.

Interdisciplinary Connections	
NJSLS- ELA	**NJSLS- Mathematics**
RL.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what a literary text says explicitly as well as inferences drawn from the text. RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information. W.AW.7.1. Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence. W.IW.7.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content SL.PE.7.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly SL.II.7.2. Analyze the main ideas and supporting details	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

presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study	
Core Instructional Materials	Textbooks Series, Lab Materials, etc.
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries. 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8). 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b) 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience. 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 9.4.8.TL.3: Select appropriate tools to organize and present information digitally. 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3). 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.6: Analyze climate change computational models and propose refinements. 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best

Modifications				
Multilingual Learners	**Special Education**	**At Risk for School Failure**	**Gifted and Talented**	**504**
Scaffolding Word walls Sentence/paragraph frames Bilingual dictionaries/translation Think alouds Read alouds Highlight key vocabulary Annotation guides Think-pair- share	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator	Teacher tutoring Peer tutoring Study guides Graphic organizers Extended time Parent communication Modified assignments Counseling	Curriculum compacting Challenge assignments Enrichment activities Tiered activities Independent research/inquiry Collaborative teamwork Higher level questioning Critical/Analytical thinking tasks Self-directed activities	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator

Visual aides Modeling Cognates	Highlighter Color contrast			Highlighter Color contrast Parent communication Modified assignments Counseling

LIFE SCIENCE		
MS-LS1-6 From Molecules to Organisms: Structures and Processes		
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.		
Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.		
Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.		
Evidence Statements: MS-LS1-6		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories. Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** Science knowledge is based upon logical connections between evidence and explanations.	**LS1.C: Organization for Matter and Energy Flow in Organisms** Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. PS3.D: Energy in Chemical Processes and Everyday Life The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary)	**Energy and Matter** Within a natural system, the transfer of energy drives the motion and/or cycling of matter.
Connections to other DCIs in this grade-band: MS.PS1.B ; MS.ESS2.A		
Articulation of DCIs across grade-bands: 5.PS3.D ; 5.LS1.C ; 5.LS2.A ; 5.LS2.B ; HS.PS1.B ; HS.LS1.C ; HS.LS2.B ; HS.ESS2.D		
5E Model		
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.		

Engage Anticipatory Set	http://studyjams.scholastic.com/studyjams/jams/science/plants/photosynthesis.htm
Exploration Student Inquiry	Have students view the following video, read the related essay and respond to the related discussion questions. http://www.pbslearningmedia.org/resource/tdc02.sci.life.stru.photosynth/photosynthesis/ Do you think that the factory is a good analogy for the process of photosynthesis in plants? Why did Von Helmont think that plants got their nourishment from soil? Why did he eliminate soil as a source of nourishment and focus on water? What did he measure to find out if the willow plant got its nourishment from soil? Illuminating Photosynthesis Have students complete the interactive activity which will investigate the process of photosynthesis. http://www.pbslearningmedia.org/resource/tdc02.sci.life.stru.methusweb/illuminating-photosynthesis/ http://d43fweuh3sg51.cloudfront.net/media/assets/wgbh/tdc02/tdc02_doc_photosyn/tdc02_doc_photosyn.pdf Photosynthesis: Watch It Happen http://www.hometrainingtools.com/a/photosynthesis-project/ How do organisms obtain and use matter and energy? How do matter and energy move through an ecosystem? Why are plants critical for the survival of animals? What do plants make that animals need?
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.C: Organization for Matter and Energy Flow in Organisms Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. PS3.D: Energy in Chemical Processes and Everyday Life The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary)
Elaboration Extension Activity	Terrarium Students will build a terrarium and then observe it throughout the unit. To build a simple soda bottle terrarium using stations in the classroom. http://www.uscsd.k12.pa.us/cms/lib02/PA01000033/Centricity/Domain/342/Pennsylvania_Terrariums_Lesson_Plan.pdf
Evaluation Assessment Tasks	Assessment Task A: Written Scientific Explanation

	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. Explanation should include evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. Information learned in above activities should be used to construct the explanation.

LIFE SCIENCE		
MS-LS1-7 From Molecules to Organisms: Structures and Processes		
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.		
Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.		
Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.		
Evidence Statements: MS-LS1-7		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop a model to describe unobservable mechanisms.	**LS1.C: Organization for Matter and Energy Flow in Organisms** Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. PS3.D: Energy in Chemical Processes and Everyday Life 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)	**Energy and Matter** Matter is conserved because atoms are conserved in physical and chemical processes.
Connections to other DCIs in this grade-band: MS.PS1.B		
Articulation of DCIs across grade-bands: 5.PS3.D ; 5.LS1.C ; 5.LS2.B ; HS.PS1.B ; HS.LS1.C ; HS.LS2.B		

5E Model	
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.	
Engage Anticipatory Set	http://ed.ted.com/lessons/the-simple-but-fascinating-story-of-photosynthesis-and-food-amanda-ooten http://www.pbslearningmedia.org/asset/tdc02_int_energyflow/ Continue the lesson by having students journal in their notebooks all the food that they ate from either dinner or lunch. Students should then categorize the food items into plant or animal. Students should then identify what the animals eat as their food source. Teacher facilitates student discussion leading students to the idea that all food traces back to plants. Students are encouraged to find food items they believe do not trace back to plants in order to enhance discussion.

	Pose the question: "Why are plants so essential to animals?"
Exploration Student Inquiry	<u>Introduction:</u> All parts of the body (muscles, brain, heart, and liver) need energy to work. This energy comes from the food we eat. Our bodies digest the food we eat by mixing it with fluids (acids and enzymes) in the stomach. When the stomach digests food, the carbohydrate (sugars and starches) in the food breaks down into another type of sugar, called glucose. The stomach and small intestines absorb the glucose and then release it into the bloodstream. Once in the bloodstream, glucose can be used immediately for energy or stored in our bodies, to be used later. In groups, have students develop a diagram which demonstrates the chemical changes that food undergoes and how these changes result in the release of energy. A sample model may begin with the food item, the eating of the item and then the digestion of the item. At each step students should be identifying how the food item was rearranged, where are the molecules going, what are the molecules/energy being used for by the organism. Have students walk around the room and look at each other's diagrams. Have them discuss what they noticed about each other's diagrams. If you have access to a document camera you can use this to share the diagrams. Guide the discussion to focus on different steps that groups may have illustrated. Have the class select the steps to make 1 class model. <u>Exploration Questions:</u> How do organisms obtain and use matter and energy? How do matter and energy move through an ecosystem? Why are plants critical for the survival of animals? What do plants make that animals need?
Explanation Concepts and Practices	<u>In these lessons</u> Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. <u>Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas):</u> <u>LS1.C: Organization for Matter and Energy Flow in Organisms</u> <u>Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy.</u> <u>PS3.D: Energy in Chemical Processes and Everyday Life 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)</u>
Elaboration Extension Activity	<u>Digital Presentation</u> Have students synthesize the information they have gathered from the class diagrams to create a digital presentation which illustrates the chemical reactions of food and how this transfers into energy. Students should incorporate information presented in all group diagrams.
Evaluation Assessment Tasks	<u>Assessment Task A: 3D Model</u> <u>Develop a model to describe unobservable mechanisms.</u> Use attached rubric to assess models created by students.

	3D Model Rubric

Unit 8: Overview
Unit 8: Earth Systems
Grade: 7
Content Area: Earth and Space Science
Pacing: 30 Instructional Days
Essential Question
If no one was there, how do we know the Earth's history?
What provides the forces that drive Earth's systems?
Student Learning Objectives (Performance Expectations)
MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
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.
Unit 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.
Technical Terms
Geoscience, erratic, valley glacier, continental glacier, calving, till, drumlin, crevasse, arete, horn, hanging valley, cirque, torn, Lateral Moraine, Medial Moraine, Terminal Moraine, Glacier Trough, Glacier Trough, scale, proportions
Formative Assessment Measures
Part A: How do we know that the Earth is approximately 4.6-billion-year-old history?
Students who understand the concepts are able to: Construct a scientific explanation based on valid and reliable evidence from rock strata obtained from sources (including the students' own experiments). Construct a scientific explanation based on rock strata and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Part B: What drives the cycling of Earth's materials?
Students who understand the concepts are able to: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
Part C: Do all of the changes to Earth systems occur in similar time scales?
Students who understand the concepts are able to: Construct a scientific explanation for how geoscience processes have changed Earth's surface at varying time and spatial scales based on valid and reliable evidence obtained from sources (including the students' own experiments). Construct a scientific explanation for how geoscience processes have changed Earth's surface at varying time and spatial scales based on the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. Collect evidence about processes that change Earth's surface 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: How is it possible for the same kind of fossils to be found in New Jersey and in Africa?
Students who understand the concepts are able to:
Analyze and interpret data such as distributions of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions.
Analyze how science findings have been revised and/or reinterpreted based on new evidence about past plate motions.

Interdisciplinary Connections	
NJSLS- ELA	**NJSLS- Mathematics**
RL.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what a literary text says explicitly as well as inferences drawn from the text. RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information. W.AW.7.1. Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence. W.IW.7.2. Write informative/explanatory texts (including the	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. MP.2 Reason abstractly and quantitatively.

narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content SL.PE.7.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly SL.II.7.2. Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study		
Core Instructional Materials	Textbooks Series, Lab Materials, etc.	
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries. 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).	

	9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b) 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience. 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 9.4.8.TL.3: Select appropriate tools to organize and present information digitally. 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3). 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.
Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.6: Analyze climate change computational models and propose refinements. 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.

Modifications				
Multilingual Learners	**Special Education**	**At Risk for School Failure**	**Gifted and Talented**	**504**
Scaffolding	Word walls	Teacher tutoring	Curriculum compacting	Word walls

Word walls Sentence/paragraph frames Bilingual dictionaries/translation Think alouds Read alouds Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling Cognates	Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast	Peer tutoring Study guides Graphic organizers Extended time Parent communication Modified assignments Counseling	Challenge assignments Enrichment activities Tiered activities Independent research/inquiry Collaborative teamwork Higher level questioning Critical/Analytical thinking tasks Self-directed activities	Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast Parent communication Modified assignments Counseling

EARTH AND SPACE SCIENCES		
MS-ESS1-4 Earth's Place in the Universe		
MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.		
Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.		
Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.		
Evidence Statements: MS-ESS1-4		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	**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.	**Scale, Proportion, and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Connections to other DCIs in this grade-band: MS.LS4.A ; MS.LS4.C	
Articulation of DCIs across grade-bands: 3.LS4.A ; 3.LS4.C ; 3.LS4.D ; 4.ESS1.C ; HS.PS1.C ; HS.LS4.A ; HS.LS4.C ; HS.ESS1.C ; HS.ESS2.A	
5E Model	
MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.	
Engage Anticipatory Set	How do geologists understand the Earth's history? In part, they measure the age of rocks and other natural materials by dating techniques. They can date rocks by gauging the amount of decay of radioactive elements. The time necessary for half of any given amount of one element (the "parent element") to decay to become another element (the "daughter element") is called the element's "half-life. Geologic Time Scale: Video and Quiz http://study.com/academy/lesson/geologic-time-scale-major-eons-eras-periods-and-epochs.html
Exploration Student Inquiry	In these activities, students simulate the dating process with popcorn. Popcorn starts out as unpopped "parent" kernels. Heating causes the kernels to begin popping, thereby starting your simulated "radioactive decay clock" and producing popped "daughter" popcorn. The half-life of your kernel-popcorn material is the time necessary for half of the given kernels to become popcorn. http://geoinfo.nmt.edu/education/exercises/PopcornDating/home.html Geological Time Project In this multi-day project, student will explore how Earth's rocks and other materials provide a record of its history. http://betterlesson.com/lesson/637351/geologic-time-mini-project
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. 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.
Elaboration Extension Activity	Biostratigraphy Students will investigate how index fossils are used to construct the geologic time scale. Students will investigate the evidence used to construct the geologic time scale and recognize that the evidence used to construct the geologic time scale comes from observations from all over the world and includes fossil evidence, radiometric age data and comparative studies of different rock sequences. Students will learn how fossils are used to construct the geologic time scale. https://gtm-media.discoveryeducation.com/videos/DSC/data/ESS_TX_GeologicTimeScale_HOL_Biostratigraphy.pdf

Evaluation Assessment Tasks	Assessment Task A: (Dating Popcorn activity) 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. Students will examine charts and graphs created. Using the following guiding questions, students will construct a written explanation based on evidence from activity, theories, and laws. Guiding questions: Discuss the ways in which experimental errors can affect your results. How might your experimental popcornium/kernelite decay system differ from a natural radioactive decay process, such as occurs in volcanic ash layers in ice cores? How else might scientists use radio isotopic dating to study climate history and other geologic records? Assessment Task B: Geological Time Data Sheet https://docs.google.com/document/d/12dNUjd6aiwodMKt42OZyV4tVr1joD3JlzjgB2JvkPfo/edit Assessment Task C: Geological Time Interactive Poster Use the following Poster Rubric http://betterlesson.com/lesson/resource/3297665/rubric-geologic-time-interactive-poster?from=resource_image

EARTH AND SPACE SCIENCE		
MS-ESS2-1 Earth's Systems		
MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.		
Clarification Statement: 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.		
Assessment Boundary: Assessment does not include the identification and naming of minerals.		
Evidence Statements: MS-ESS2-1		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop and use a model to describe phenomena.	**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.	**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.
Connections to other DCIs in this grade-band: MS.PS1.A ; MS.PS1.B ; MS.PS3.B ; MS.LS2.B ; MS.LS2.C ; MS.ESS1.B ; MS.ESS3.C		
Articulation of DCIs across grade-bands: 4.PS3.B ; 4.ESS2.A ; 5.ESS2.A ; HS.PS1.B ; HS.PS3.B ; HS.LS1.C ; HS.LS2.B ; HS.ESS2.A ; HS.ESS2.C ; HS.ESS2.E		
5E Model		
MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.		

Engage Anticipatory Set	Form small groups of students and distribute chart paper, markers, and rock samples. Each group will investigate its given rock samples and sort them according to common characteristics (crystallization, smooth, glassy, etc.). Then each group will record these characteristics on the chart paper. The teacher will circulate around the room and ask guiding questions (EX: Explain how you characterized your rock samples. Why did you sort these rocks the way you did?) One student representative from each group will visit another group and observe how that group categorized their rock samples. They will return to their original group and discuss the comparisons. The teacher will engage the students in a whole group discussion about the engagement activity. The teacher will help students build upon prior knowledge of the different types of rocks: sedimentary, igneous, and metamorphic. Then students will view a short video clip that further details the journey a rock takes through the rock cycle. https://www.khanacademy.org/partner-content/mit-k12/mit-k12-biology/v/rock-cycle (Grade level videos- also covers the flow of energy) http://studyjams.scholastic.com/studyjams/jams/science/rocks-minerals-landforms/rock-cycle.htm https://www.youtube.com/watch?v=uAAeFB7Tv5A
Exploration Student Inquiry	Present the online PowerPoint: Energy in the Rock Cycle http://www.uen.org/Lessonplan/downloadFile.cgi?file=36937-2-43128-EnergyinCyclePPT_.pptx&filename=EnergyinCyclePPT_.pptx Ride the Rock Cycle http://teacherstryscience.org/lp/ride-rock-cycle In this multi day lesson, students will: Participate in a kinesthetic activity related to the rock cycle Compare/ contrast representations of data Design their own simulation of the rock cycle Activity 1: Ride the Rock Cycle In this interactive game, students will act as a rock going through the rock cycle. Students will track their journey using the Journey on the Rock Cycle worksheet. Students will synthesize the information gathered during the activity by creating a Comic Strip that outlines the process of the rock cycle. Activity 4: Design & Simulation Task Students will explore the environmental factors that can affect rocks including erosion/weathering, deposition, cementation/ compaction, heating, pressure, and cooling.
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. 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.

Elaboration Extension Activity	In this extension activity, students will describe which processes might be affecting a given region, using evidence from natural features presented on a map. Rock Cycle Roundabout http://www.calacademy.org/educators/lesson-plans/rock-cycle-roundabout
Evaluation Assessment Tasks	Assessment Task A: Ride the Rock Cycle- Comic Strip Student Worksheets and Rubrics Assessment Task B: Environmental Factors Rubric Develop and use a model to describe phenomena. Student Worksheets and Rubrics

EARTH AND SPACE SCIENCE		
MS-ESS2-2 Earth's Systems		
MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.		
Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.		
Assessment Boundary: N/A		
Evidence Statements: MS-ESS2-2		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future.	**ESS2.A: Earth's Materials and Systems** The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. **ESS2.C: The Roles of Water in Earth's Surface Processes** Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.	**Scale Proportion and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Connections to other DCIs in this grade-band: MS.PS1.B ; MS.LS2.B	
Articulation of DCIs across grade-bands: 4.ESS1.C ; 4.ESS2.A ; 4.ESS2.E ; 5.ESS2.A ; HS.PS3.D ; HS.LS2.B ; HS.ESS1.C ; HS.ESS2.A ; HS.ESS2.B ; HS.ESS2.C ; HS.ESS2.D ; HS.ESS2.E ; HS.ESS3.D	
5E Model	
MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.	
Engage Anticipatory Set	Weather and Erosion Introduction Activity: http://www.scoe.net/slypark/pdf/Pre_Sly_Park-Shaping_Earth's_Surface_Activity.pdf Plate Tectonics Video: http://education.nationalgeographic.org/media/plate-tectonics/
Exploration Student Inquiry	Geological Timeline: Discovery The purpose of this lesson is to introduce students to the features of geologic timelines. http://betterlesson.com/lesson/637787/geologic-timeline-discovery Convection Current http://betterlesson.com/lesson/633215/convection-currents In this activity, students will identify that temperature change impacts the density of a substance, and the resulting change can cause movement inside the Earth. In completing these activities, students will have concrete experiences that they can refer to when constructing explanations about the big idea- how geoscience processes have changed Earth's surface. Have students construct an explanation to the following questions. Explanations should be based on evidence they gained from the activity, Scientists have estimated that the temperature of the Earth's core may be as warm as 10,800 degrees Fahrenheit - how is the Earth's mantle which lies just above the core affected by the temperature of the Earth's core? What happens as the mantle is heated? What happens as it becomes less dense? What happens to the mantle as the heated material rises? We call the circular motion created by the heating and cooling of fluids a convection current. How might this convection current cause tectonic plate movement?
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. ESS2.A: Earth's Materials and Systems The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. ESS2.C: The Roles of Water in Earth's Surface Processes Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.

Elaboration Extension Activity	Related Activities Earth Science Week MS-ESS2-2 http://www.earthsciweek.org/ngss-performance-expectations/ms-ess2-2
Evaluation Assessment Tasks	Assessment Task A: Constructed-Responses 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 nature operate today as they did in the past and will continue to do so in the future.

EARTH AND SPACE SCIENCE		
MS-ESS2-3 Earth's Systems		
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.		
Clarification Statement: Examples of 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).		
Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.		
Evidence Statements: MS-ESS2-3		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Analyze and interpret data to determine similarities and differences in findings. **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.	**ESS1.C: The History of Planet Earth** Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE),(secondary) **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.	**Patterns** Patterns in rates of change and other numerical relationships can provide information about natural systems.
Connections to other DCIs in this grade-band: MS.LS4.B		
Articulation of DCIs across grade-bands: 3.LS4.A ; 3.ESS3.B ; 4.ESS1.C ; 4.ESS2.B ; 4.ESS3.B ; HS.LS4.A ; HS.LS4.C ; HS.ESS1.C ; HS.ESS2.A ; HS.ESS2.B		
5E Model		
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.		

Engage Anticipatory Set	Fossil Evidence of Plate Tectonics https://prezi.com/plwzjedxstfi/fossil-evidence-of-plate-tectonics/
Exploration Student Inquiry	The Theory of Plate Tectonics In this activity, students will gather evidence to explain the theory of plate tectonics. https://www.teachengineering.org/collection/csm_/activities/csm_platetectonics/csm_platetectonics_activity1_worksheet_v3_tedl_dwc.pdf Pangaea- Wegener's Puzzling Evidence In this activity, students will use fossil evidence and maps to write an evidence-based position statement defending or refuting the theory of continental drift. http://betterlesson.com/lesson/635197/pangaea-wegener-s-puzzling-evidence
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. ESS1.C: The History of Planet Earth Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE),(secondary) 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.
Elaboration Extension Activity	Plate Tectonics Puzzle American Museum of Natural History: Plate Tectonic Puzzle
Evaluation Assessment Tasks	Assessment Task A: Theory of Plate Tectonics- Position Paper Analyze and interpret data to determine similarities and differences in findings. The Theory of Plate Tectonics: Using information learned from activity, students will determine whether they would support Wegener's hypothesis or not. Then students will construct a written explanation that explains their position. Assessment Task B: Pangaea - Wegener's Puzzling Evidence- Position Paper After modeling the stating of specific evidence as a whole class discussion, students write a position statement in their science journals. The requirement is to cite four pieces of compelling evidence that leads them to agree or disagree with Wegener's ideas about plate movement using their maps and fossil evidence.