# Rochelle Park School District

## Curriculum Guide

# Science
# Grade 6

BOE Approved on August 30, 2022

| Unit 1: Overview |
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| [Unit 1: Weather and Climate]() |
| **Grade: 6** |
| **Content Area: Earth and Space Science** |
| **Pacing: 20 Instructional Days** |
| **Essential Question** |
| What factors interact and influence weather and climate? |
| **Student Learning Objectives (Performance Expectations)** |
| **MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.** |
| **MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.** |
| **MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.** |
| **Unit Summary** |
| This unit is broken down into three sub-ideas: Earth's large-scale systems interactions, the roles of water in Earth's surface processes, and weather and climate. Students make sense of how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. A systems approach is also important here, examining the feedbacks between systems as energy from the Sun is transferred between systems and circulates through the ocean and atmosphere. The crosscutting concepts of cause and effect, systems and system models, and energy and matter are called out as frameworks for understanding the disciplinary core ideas. In this unit, students are expected to demonstrate proficiency in developing and using models and planning and carrying out investigations as they make sense of the disciplinary core ideas. Students are also expected to use these practices to demonstrate understanding of the core ideas. |
| **Technical Terms** |
| Geosystems, cycling of matter, flow of energy, advection, radiation, conduction, convection, insulation, albedo, troposphere, stratosphere, thermosphere, ionosphere, trophism |
| **Formative Assessment Measures** |
| *Part A: What are the processes involved in the cycling of water through Earth's systems?* |
| Students who understand the concepts are able to:<br>Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.<br>Model the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. |
| *Part B: What is the relationship between the complex interactions of air masses and changes in weather conditions?* |
| Students who understand the concepts are able to:<br>Collect data to serve as the basis for evidence for how the motions and complex interactions of air masses result in changes in weather conditions. |
| *Part C: What are the major factors that determine regional climates?* |

Students who understand the concepts are able to:
Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

**Interdisciplinary Connections**

| **NJSLS- ELA** | **NJSLS- Mathematics** |
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| Cite specific textual evidence to support analysis of science and technical texts.(MS-ESS2-5),(MS-ESS3-5) RST.6-8.1<br>Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.(MS-ESS2-5) RST.6-8.9<br>Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.(MS-ESS2-5) WHST.6-8.8<br>Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.(MS-ESS2-6) SL.8.5 | Reason abstractly and quantitatively.(MS-ESS2-5),(MS-ESS3-5) MP.2<br>Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.(MS-ESS2-5) 6.NS.C.5<br>Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.(MS-ESS3-5) 6.EE.B.6 |

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| **Core Instructional Materials** | • Nearpod<br>• Brainpop<br>• Stations Labs<br>• Mr Parr Science songs<br>• Ed Puzzle |
| **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., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).<br>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.<br>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). |
| **Computer Science and Design Thinking** | 8.1.8.DA.6: Analyze climate change computational models and propose refinements.<br>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.<br>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. | | | |
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| **Modifications** | | | | |
| **English Language Learners** | **Special Education** | **At-Risk** | **Gifted and Talented** | **504** |
| Scaffolding<br>Word walls<br>Sentence/paragraph frames<br>Bilingual dictionaries/translation<br>Think alouds<br>Read alouds<br>Highlight key vocabulary<br>Annotation guides<br>Think-pair- share<br>Visual aides<br>Modeling<br>Cognates | Word walls<br>Visual aides<br>Graphic organizers<br>Multimedia<br>Leveled readers<br>Assistive technology<br>Notes/summaries<br>Extended time<br>Answer masking<br>Answer eliminator<br>Highlighter<br>Color contrast | Teacher tutoring<br>Peer tutoring<br>Study guides<br>Graphic organizers<br>Extended time<br>Parent communication<br>Modified assignments<br>Counseling | Curriculum compacting<br>Challenge assignments<br>Enrichment activities<br>Tiered activities<br>Independent research/inquiry<br>Collaborative teamwork<br>Higher level questioning<br>Critical/Analytical thinking tasks<br>Self-directed activities | Word walls<br>Visual aides<br>Graphic organizers<br>Multimedia<br>Leveled readers<br>Assistive technology<br>Notes/summaries<br>Extended time<br>Answer masking<br>Answer eliminator<br>Highlighter<br>Color contrast<br>Parent communication<br>Modified assignments<br>Counseling |

## Unit 2: Overview

| Unit 2: Human Impacts |
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| **Grade: 6** |
| **Content Area: Earth and Space Science** |
| **Pacing: 25 Instructional Day** |
| **Essential Questions** |
| How do we monitor the health of the environment (our life support system)?<br>Is it possible to predict and protect ourselves from natural hazards? |
| **Student Learning Objectives (Performance Expectations)** |
| **MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.** |
| **MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.** |
| **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** |
| In this unit of study, students analyze and interpret data and design solutions to build on their understanding of the ways that human activities affect Earth's systems. The emphasis of this unit is the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of these uses. The crosscutting concepts of cause and effect and the influence of science, engineering, and technology on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Building on Unit 3, students define a problem by precisely specifying criteria and constraints for solutions as well as potential impacts on society and the natural environment; systematically evaluate alternative solutions; analyze data from tests of different solutions; combining the best ideas into an improved solution; and develop and iteratively test and improve their model to reach an optimal solution.In this unit of study students are expected to demonstrate proficiency in analyzing and interpreting data and designing solutions.Students are also expected to use these practices to demonstrate understanding of the core ideas. |
| **Technical Terms** |
| Aquifers, levee, urban development, pollution, anthropogenic, particulates, ecological community |
| **Formative Assessment Measures** |
| *Part A: How do we monitor the health of the environment (our life support system)?* |
| Students who understand the concepts are able to:<br>Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. |
| **Interdisciplinary Connections** |

| NJSLS- ELA | NJSLS- Mathematics |
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| Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3) RST.6-8.1<br>Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS3-3),(MS-ETS1-3) RST.6-8.7<br>Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on the same topic. (MS-ETS1-2),(MS-ETS1-3) RST.6-8.9<br>Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ETS1-2) WHST.6-8.7<br>Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS3-3),(MS-ETS1-1) WHST.6-8.8<br>Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2) WHST.6-8.9<br>Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ETS1-4) SL.8.5 | Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS3-3) 6.EE.B.6<br>Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS3-3) 7.EE.B.4<br>Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS3-3) 6.RP.A.1<br>Recognize and represent proportional relationships between quantities. (MS-ESS3-3) 7.RP.A.2<br>Reason abstractly and quantitatively. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3) MP.2<br>Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3) 7.EE.3 |

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| **Core Instructional Materials** | • Lab stations activity<br>• Teacher made products<br>• Brain pop<br>• Nearpod<br>• Ed puzzle<br>• Flip grid |

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| **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.<br>9.4.8.CI.2 Repurpose an existing resource in an innovative way.<br>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.<br>9.4.8.CT.2 Develop multiple solutions to a problem an evaluate short- and long-term effects to determine the most plausible option,<br>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.<br>9.4.8.DC.8 Explain how communities use data and technology to develop measures to respond to effects of climate change.<br>9.4.8.IML.5 Analyze and interpret local or public dataset to summarize and effectively communicate data.<br>9.4.8.IML.8 Apply deliberate and thoughtful search strategies to access high-quality information on climate change.<br>9.4.8.IML.12 Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.<br>9.4.8.TL.2 Gather data and digitally represent information to communicate a real-world problem.<br>9.4.8.TL.4 Synthesize and publish information about a local or global issue or event.<br>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.DA1 Organize and transform data collected using computational tools to make it usable for a specific purpose.<br>8.1.8.DA.6 Analyze climate change computational models and propose refinements.<br>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.<br>8.2.8.ITH.2 Compare how technologies have influenced society over time.<br>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.<br>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.<br>8.2.8.ETW.2 Analyze the impact of modifying resources in a product or system.<br>8.2.8.ETW.3 Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen the impact.<br>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 | | | | |
|---|---|---|---|---|
| **English Language Learners** | **Special Education** | **At-Risk** | **Gifted and Talented** | **504** |
| Scaffolding<br>Word walls<br>Sentence/paragraph frames<br>Bilingual dictionaries/translation<br>Think alouds<br>Read alouds<br>Highlight key vocabulary<br>Annotation guides<br>Think-pair- share<br>Visual aides<br>Modeling<br>Cognates | Word walls<br>Visual aides<br>Graphic organizers<br>Multimedia<br>Leveled readers<br>Assistive technology<br>Notes/summaries<br>Extended time<br>Answer masking<br>Answer eliminator<br>Highlighter<br>Color contrast | Teacher tutoring<br>Peer tutoring<br>Study guides<br>Graphic organizers<br>Extended time<br>Parent communication<br>Modified assignments<br>Counseling | Curriculum compacting<br>Challenge assignments<br>Enrichment activities<br>Tiered activities<br>Independent research/inquiry<br>Collaborative teamwork<br>Higher level questioning<br>Critical/Analytical thinking tasks<br>Self-directed activities | Word walls<br>Visual aides<br>Graphic organizers<br>Multimedia<br>Leveled readers<br>Assistive technology<br>Notes/summaries<br>Extended time<br>Answer masking<br>Answer eliminator<br>Highlighter<br>Color contrast<br>Parent communication<br>Modified assignments<br>Counseling |

| EARTH AND SPACE SCIENCE | | |
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| **MS-ESS3-3 Earth and Human Activity** | | |
| **MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.** | | |
| **Clarification Statement:** Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land). | | |
| **Assessment Boundary:** N/A | | |
| Evidence Statements: MS-ESS3-3 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Constructing Explanations and Designing Solutions**<br>Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to | **ESS3.C: Human Impacts on Earth Systems**<br>Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But | **Cause and Effect**<br>Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.<br>**Connections to Engineering, Technology, and Applications of Science** |

<table>
<tr><td>include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.<br>Apply scientific principles to design an object, tool, process or system.</td><td>changes to Earth's environments can have different impacts (negative and positive) for different living things.<br>Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.</td><td>Influence of Science, Engineering, and Technology on Society and the Natural World<br>The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.</td></tr>
<tr><td colspan="3">Connections to other DCIs in this grade-band: MS.LS2.A ; MS.LS2.C , MS.LS4.D</td></tr>
<tr><td colspan="3">Articulation of DCIs across grade-bands: 3.LS2.C ; 3.LS4.D ; 5.ESS3.C ; HS.LS2.C ; HS.LS4.C ; HS.LS4.D ; HS.ESS2.C ; HS.ESS2.D ; HS.ESS2.E ; HS.ESS3.C ; HS.ESS3.D</td></tr>
<tr><td colspan="3">NJSLS- ELA: WHST.6-8.7, WHST.6-8.8</td></tr>
<tr><td colspan="3">NJSLS- Math: 6.RP.A.1, 7.RP.A.2, 6.EE.B.6, 7.EE.B.4</td></tr>
<tr><td colspan="3">5E Model</td></tr>
<tr><td colspan="3">MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.</td></tr>
<tr><td>Engage<br>Anticipatory Set</td><td colspan="2">Have students view the following video and online quiz<br>Human Impact on the Environment:<br>http://study.com/academy/lesson/human-impacts-on-the-environment.html</td></tr>
<tr><td>Exploration<br>Student Inquiry</td><td colspan="2">Will the Air Be Clean Enough to Breath?<br>This online interactive program consists of five modules. In completing these activities, students will explore real-time air quality data with maps from the United States EPA. They will run experiments with computational models to investigate how pollutants flow in the atmosphere and look at how factors such as wind, sun, rain, geography and pollution affect air quality. By the end of the module, students will be able to predict the effect of human development on a region's future air quality.<br>http://concord.org/stem-resources/will-air-be-clean-enough-breathe<br>Design Your Society<br>In this activity, students will use all they have learned about the potential impacts of climate change to create a 3D model of a self-sustaining, resilient society.<br>http://betterlesson.com/lesson/644797/design-your-society</td></tr>
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| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS3.C: Human Impacts on Earth Systems<br>Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.<br>Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. |
| **Elaboration**<br>Extension Activity | Mix and Math Ecology: Human Impact<br>Challenge students to think of a way to reduce the threat to the natural resource of their mix-and-match combinations without eliminating the human action.<br>http://www.learnnc.org/lp/media/uploads/2008/12/ecologyworksheet.pdf<br><br>In what ways could the human action be changed to achieve the same result but with better environmental consequences?<br>Could any buffers or protection be placed on the ecological communities that might better preserve the natural resource?<br>What policies or laws could be passed that might help? |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Design Your Society using Google Sketch Up<br>Apply scientific principles to design an object, tool, process or system.<br>Using what students have learned about the potential impacts of climate change, students will create a 3D model of a self-sustaining, resilient society (using Google Sketch Up).<br><br>Assessment Task B: Society Presentations<br>Students will present 3D models to the class. Students viewing the presentations will use the Society Presentation Notes Guide to synthesize and interpret information learned from presentations. |

| **EARTH AND SPACE SCIENCE** |
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| **MS-ESS2-4 Earth's Systems** |
| **MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.** |
| **Clarification Statement:** Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical. |
| **Assessment Boundary:** A quantitative understanding of the latent heats of vaporization and fusion is not assessed. |

| Evidence Statements: MS-ESS2-4 | | |
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| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Developing and Using Models**<br>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.<br>Develop a model to describe unobservable mechanisms. | **ESS2.C: The Roles of Water in Earth's Surface Processes**<br>Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.<br>Global movements of water and its changes in form are propelled by sunlight and gravity | **Energy and Matter**<br>Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. |
| **Connections to other DCIs in this grade-band: MS.PS1.A ; MS.PS2.B ; MS.PS3.A ; MS.PS3.D** | | |
| **Articulation of DCIs across grade-bands: 3.PS2.A ; 4.PS3.B ; 5.PS2.B ; 5.ESS2.C ; HS.PS2.B ; HS.PS3.B ; HS.PS3.D ; HS.PS4.B ; HS.ESS2.A ; HS.ESS2.C ; HS.ESS2.D** | | |
| **NJSLS- ELA: N/A** | | |
| **NJSLS- Math: N/A** | | |

| **5E Model** | |
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| **MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.** | |
| **Engage**<br>Anticipatory Set | Amazon Water Cycle Role Play<br>http://www.calacademy.org/educators/lesson-plans/amazon-water-cycle-role-play |
| **Exploration**<br>Student Inquiry | Modeling Watershed<br>In this activity, students use models to demonstrate how energy from the sun and the force of gravity impacts how groundwater moves.<br>http://betterlesson.com/lesson/638308/modeling-watersheds |

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| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS2.C: The Roles of Water in Earth's Surface Processes<br>Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.<br>Global movements of water and its changes in form are propelled by sunlight and gravity. |
| **Elaboration**<br>Extension Activity | Hands-on Activity: Natural and Urban "Stormwater" Water Cycle Models<br>https://www.teachengineering.org/view_activity.php?url=collection/usf_/activities/usf_stormwater/usf_stormwater_lesson01_activity1.xm<br>Monthly Climate Tables/Precipitation Charts<br>http://climate.rutgers.edu/stateclim_v1/data/index.html<br>Discussion Questions:<br>How does duration and intensity of precipitation impact the water cycle?<br>Compare the precipitation totals of different regions of NJ<br>How would storms affect the movement of water through the water cycle?<br>Related Activities:<br>Earth Science Week<br>http://www.earthsciweek.org/ngss-performance-expectations/ms-ess2-4 |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Groundwater Simulator<br>Model Rubric |

| EARTH AND SPACE SCIENCE |
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| **MS-ESS2-5 Earth's Systems** |
| **MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.** |
| **Clarification Statement:** Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation). |
| **Assessment Boundary:** Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations. |
| Evidence Statements: MS-ESS2-5 |

| Science & Engineering Practices | Disciplinary Core Ideas | Cross-Cutting Concepts |
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| **Planning and Carrying Out Investigations**<br>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.<br>Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. | **ESS2.C: The Roles of Water in Earth's Surface Processes**<br>The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.<br>**ESS2.D: Weather and Climate**<br>Because these patterns are so complex, weather can only be predicted probabilistically. | **Cause and Effect**<br>Cause and effect relationships may be used to predict phenomena in natural or designed systems. |

**Connections to other DCIs in this grade-band: MS.PS1.A ; MS.PS2.A ; MS.PS3.A ; MS.PS3.B**

**Articulation of DCIs across grade-bands: 3.ESS2.D ; 5.ESS2.A ; HS.ESS2.C ; HS.ESS2.D**

**NJSLS- ELA: RST.6-8.1, RST.6-8.9, WHST.6-8.8**

**NJSLS- Math: MP.2, 6.NS.C.5**

| 5E Model | |
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| **MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.** | |
| **Engage**<br>Anticipatory Set | Begin lesson by showing a short video clip of a broadcast weather forecast by going to following website:<br>Weather Channel<br>Select the Forecast tab. Choose the national forecast and play this for the class. You can also try any of the major network station websites either in your area or nationally for their videos.<br>After showing the video, ask the class how daily information is presented?<br>What units are given? Where is evidence of fronts, high/low pressure, temperature, precipitation, cloud cover, humidity or wind speeds?<br>Much of what they will be studying is captured in a few minutes of video and now it's their turn to try their hand at predicting the weather. |

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| **Exploration**<br>Student Inquiry | Weather Forecasting Online Activity<br>In this lesson, students will analyze weather maps as they develop their own understanding of the relationships between air pressure and clouds, factors that influence climate, weather fonts and the jet stream.<br>http://betterlesson.com/lesson/638300/weather-forecasting-online-activity |
| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS2.C: The Roles of Water in Earth's Surface Processes<br>The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.<br>ESS2.D: Weather and Climate<br>Because these patterns are so complex, weather can only be predicted probabilistically. |
| **Elaboration**<br>Extension Activity | Once students have made their predictions and reviewed them with the teacher, ask them to reflect on the accuracy of their model. Ask them to write a paragraph that compares their prediction to the actual forecast for day 4. What was similar? What was different? Were they surprised by the outcome? Did it bring up any questions? Ask students to hold a discussion with their partner before drafting the final paragraph. |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Weather Forecasting Packets<br>http://betterlesson.com/lesson/resource/3250148/weather-forecasting-internet-packet?from=resource_title<br>Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.<br>Assessment Task B: Weather Forecasting Discussion Questions<br>http://betterlesson.com/lesson/resource/3250150/weather-forecasting-discussion-questions<br>Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. |

| EARTH AND SPACE SCIENCE | | |
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| **MS-ESS2-6 Earth's Systems** | | |
| **MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.** | | |
| **Clarification Statement:** Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations. | | |
| **Assessment Boundary:** Assessment does not include the dynamics of the Coriolis effect. | | |
| Evidence Statements: MS-ESS2-6 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Developing and Using Models**<br>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.<br>Develop and use a model to describe phenomena. | **ESS2.C: The Roles of Water in Earth's Surface Processes**<br>Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.<br>**ESS2.D: Weather and Climate**<br>Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.<br>The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. | **Systems and System Models**<br>Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. |
| **Connections to other DCIs in this grade-band: MS.PS2.A ; MS.PS3.B ; MS.PS4.B** | | |
| **Articulation of DCIs across grade-bands: 3.PS2.A ; 3.ESS2.D ; 5.ESS2.A ; HS.PS2.B ; HS.PS3.B ; HS.PS3.D ; HS.ESS1.B ; HS.ESS2.A ; HS.ESS2.D** | | |
| **NJSLS- ELA: SL.8.5** | | |
| **NJSLS- Math: N/A** | | |

| 5E Model | |
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| **MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.** | |
| **Engage** Anticipatory Set | Begin with a question-answer activity- Have you ever been to the beach on a hot day? Where is it cooler, on the water or on the sand? Demonstration- using two lamps. One lamp should be over a tray of water, one lamp should be over a tray of sand. Students will be able to touch the water and the sand and compare and contrast the difference in the temperature. Thermometers can also be used to determine the temperature of the sand and water. Ask students, If sand and water both absorb energy from the sun why do they feel so different? |

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| **Exploration**<br>Student<br>Inquiry | <u>Day 1:</u><br>Group students into pairs. Conduct the following experiment using these resources:<br>Before conducting the experiment, students make predictions about the rate of heating for each material. During the experiment, students will collect data and make inferences based on their observations. Students will record information in data tables and later analyze their data.<br>1. Fill one cup with water.<br>2. Fill one cup with soil.<br>3. Stand one thermometer in the water and one in the soil.<br>4. Read and record the temperatures of each cup at room temperature.<br>5. Place both cups under the lamp. Wait several minutes for cups to absorb the lamp's heat.<br>6. Read and record the temperatures of each cup a second time.<br>7. Were there any changes in temperature? The temperature of the soil should rise (heat up) first, as the soil absorbs heat faster than water.<br>8. Remove the cans from under the lamp and leave at room temperature for several minutes.<br>9. Read and record the temperatures of each cup.<br><u>Day 2:</u><br>Students will create a graph based on the data they collected. They will graph the temperature increase and decrease over a period of minutes.<br>Students will use the data collected to draw a model (line graph) of the land and water and predict how temperature will change during the course of 24 hours (the model should show that the land heats up and cools down faster than the water). Students will present their graphs and models.<br><u>Day 3:</u><br>*Exploration Questions*<br>Hold a class discussion. Ask students to describe the heating and cooling rates of land and water in this investigation. Have students record their findings and answers to the following questions:<br>Which material held its heat longer?<br>What factors may have influenced your results?<br>Why did the land change temperature the faster than the water?<br>Next, students will observe animations of land and sea breezes.<br>Animation of Land and Sea Breezes:<br>http://www.classzone.com/books/earth_science/terc/content/visualizations/es1903/es1903page01.cfm<br>They will compare the animation to their model and prediction. Students will have to explain their models.<br>- Is the pattern in your model similar or different to those shown in the animation? Explain your findings. |

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| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS2.C: The Roles of Water in Earth's Surface Processes<br>Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.<br>ESS2.D: Weather and Climate<br>Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.<br>The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. |
| **Elaboration**<br>Extension Activity | Students will work in groups to choose a geographical area (with teacher approval) and will develop and present a weather report for this region. Some presentation options include: posters, PowerPoint Presentations and videos. Teachers will identify the components which are to be included in the presentation through the use of a rubric.<br>Additional Resource:<br>http://www.nea.org/tools/lessons/hurricane-season-grades-6-8.html |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Line Graph Model<br>Develop and use a model to describe phenomena.<br>Students will be assessed on accuracy of line graph and their ability to describe phenomena based upon data collected. Use the discussion questions as a guide.<br><br>Assessment Task B: Model Reflection Questions<br>Students will compare their models to the animation. Students must be able to answer the following question: Is the pattern in your model similar or different to those shown in the animation? Explain your findings. |

| Unit 3: Overview |
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| [Unit 3: Stability and Change on Earth] |
| **Grade: 6** |
| **Content Area: Earth and Space Science** |
| **Pacing: 30 Instructional Days** |
| **Essential Question** |
| Why aren't minerals and groundwater distributed evenly across the world? |
| **Student Learning Objectives (Performance Expectations)** |
| **MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.** |
| **MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.** |
| **MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.** |
| **MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused [rise in global temperatures] climate change over the past century.** |
| **Unit Summary** |
| Students construct an understanding of the ways that human activities affect Earth's systems. Students use practices to understand the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts on the development of these resources. Students also understand that the distribution of these resources is uneven due to past and current geosciences processes or removal by humans. The crosscutting concepts of patterns, cause and effect, and stability and change are called out as organizing concepts for these disciplinary core ideas. In this unit of study students are expected to demonstrate proficiency in asking questions, analyzing and interpreting data, constructing explanations, and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas. |
| **Technical Terms** |
| non-renewable, petroleum,organic marine sediment, geological traps , metal ores, hydrothermal, subduction zones, geoscience process, natural hazards, catastrophic events, mass wasting, per-capita consumption, solar radiation, methane, carbon dioxide |
| **Formative Assessment Measures** |
| *Part A: Why aren't minerals and groundwater distributed evenly across the world?* |
| Students who understand the concepts are able to:<br>Construct a scientific explanation based on valid and reliable evidence of how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geosciences processes.<br>Obtain evidence from sources, which must include the student's own experiments. |

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| Construct a scientific explanation based on the assumption that theories and laws that describe the current geosciences process operate today as they did in the past and will continue to do so in the future. |
| *Part B: How can we predict and prepare for natural disasters?* |
| Students who understand the concepts are able to:<br>Analyze and interpret data on natural hazards to determine similarities and differences and to distinguish between correlation and causation. |
| *Part C: How might we treat resources if we thought about the Earth as a spaceship on an extended survey of the solar system?* |
| Students who understand the concepts are able to:<br>Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. |

**Interdisciplinary Connections**

| NJSLS- ELA | NJSLS- Mathematics |
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| Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1),(MS-ESS3-2) RST.6-8.1<br>Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS3-2) RST.6-8.7<br>Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS3-1) WHST.6-8.2<br>Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1)WHST.6-8.9 | Reason abstractly and quantitatively. (MS-ESS3-2) MP.2<br>Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS3-1),(MS-ESS3-2) 6.EE.B.6<br>Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS3-1),(MS-ESS3-2) 7.EE.B.4 |

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| **Core Instructional Materials** | • Brain pop<br>• Nearpod<br>• Flip grid<br>• Ed puzzle<br>• Teacher made activities and stations |
| **Career Readiness, Life Literacies and Key Skills** | 9.4.8.CI.1 Assess data gathered on varying perspectives or causes of climate change (crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions.<br>9.4.8.CI.2 Repurpose an existing resource in an innovative way<br>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.. |

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| | 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.<br>9.4.8.DC.8 Explain how communities use data and technology to develop measures to respond to effects of climate change.<br>9.4.8.GCA.2 Demonstrate openness to diverse ideas and perspectives through active discussion to achieve a group goal.<br>9.4.8.IML.1 Critically curate multiple resources to assess the credibility of sources when researching for information.<br>9.4.8.IML.8Apply deliberate and thoughtful search strategies to access high-quality information on climate change.<br>9.4.8.IML.12 Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.<br>9.4.8.TL.2 Gather data and digitally represent information to communicate a real-world problem.<br>9.4.8.TL.4 Synthesize and publish information about a local or global issue or event.<br>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.<br>8.1.8.DA.6 Analyze climate change computational models and propose refinements.<br>8.2.8.ED.3 Develop a proposal for a solution to a real-world problem that includes a model.<br>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.<br>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.<br>8.2.8.ETW.3 Analyze the design of a product that negatively impacts the environment or society and possible solutions to lessen its impact.<br>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** | | | | |
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| **English Language Learners** | **Special Education** | **At-Risk** | **Gifted and Talented** | **504** |
| Scaffolding<br>Word walls<br>Sentence/paragraph frames<br>Bilingual dictionaries/translation<br>Think alouds<br>Read alouds<br>Highlight key vocabulary<br>Annotation guides<br>Think-pair- share<br>Visual aides | Word walls<br>Visual aides<br>Graphic organizers<br>Multimedia<br>Leveled readers<br>Assistive technology<br>Notes/summaries<br>Extended time<br>Answer masking<br>Answer eliminator<br>Highlighter | Teacher tutoring<br>Peer tutoring<br>Study guides<br>Graphic organizers<br>Extended time<br>Parent communication<br>Modified assignments<br>Counseling | Curriculum compacting<br>Challenge assignments<br>Enrichment activities<br>Tiered activities<br>Independent research/inquiry<br>Collaborative teamwork<br>Higher level questioning<br>Critical/Analytical thinking tasks<br>Self-directed activities | Word walls<br>Visual aides<br>Graphic organizers<br>Multimedia<br>Leveled readers<br>Assistive technology<br>Notes/summaries<br>Extended time<br>Answer masking<br>Answer eliminator<br>Highlighter |

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| Modeling<br>Cognates | Color contrast | | | Color contrast<br>Parent communication<br>Modified assignments<br>Counseling |

| EARTH AND SPACE SCIENCE | | |
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| **MS-ESS3-1 Earth and Human Activity** | | |
| **MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.** | | |
| **Clarification Statement:** Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock). | | |
| **Assessment Boundary:** N/A | | |
| Evidence Statements: MS-ESS3-1 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Constructing Explanations and Designing Solutions**<br>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.<br>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. | **ESS3.A: Natural Resources**<br>Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. | **Cause and Effect**<br>Cause and effect relationships may be used to predict phenomena in natural or designed systems.<br>**Connections to Engineering, Technology, and Applications of Science**<br>**Influence of Science, Engineering, and Technology on Society and the Natural World**<br>All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. |

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| **Connections to other DCIs in this grade-band: MS.PS1.A ; MS.PS1.B ; MS.ESS2.D** | |
| **Articulation of DCIs across grade-bands: 4.PS3.D ; 4.ESS3.A ; HS.PS3.B ; HS.LS1.C ; HS.ESS2.A ; HS.ESS2.B ; HS.ESS2.C ; HS.ESS3.A** | |
| **NJSLS- ELA: SL.8.5 RST.6-8.1, WHST.6-8.2, WHST.6-8.9** | |
| **NJSLS- Math: 6.EE.B.6, 7.EE.B.4** | |
| **5E Model** | |
| **MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.** | |
| **Engage**<br>Anticipatory Set | Video: Groundwater, Beneath the Surface<br>http://science.kqed.org/quest/2014/03/26/groundwater-beneath-the-surface/<br>Pre-Discussion Questions<br>What is water called beneath the surface?<br>What are some dangers facing aquifers and groundwater?<br>Post-Discussion Questions:<br>Why is groundwater so vital to us?<br>How does the water cycle operate?<br>Extension Activity<br>Name as many parts of the water cycle as you can and describe the function of each.<br>Possible activity: Draw a water cycle with as many parts as you can to show how they all interact, and then replay the animation to check and fill in the rest. Compare groundwater to aquifers. How are they alike and how are they different? How are aquifers replenished or depleted? |
| **Exploration**<br>Student Inquiry | Students will work in pairs at computer stations on the "Energy in the U.S. Webquest". Students will learn about renewable and nonrenewable energy sources and current and future consumption trends in the U.S. Students will need to utilize headphones during the video/audio sections of the Webquest in order to successfully complete it. When students complete the Webquest, the teacher will initiate a class discussion using the following discussion questions:<br>1. What agencies or organizations sponsored the Web sites you collected information from and what might their bias be?<br>2. Do you think the information presented on the Web sites is balanced?<br>3. What makes some energy sources renewable and others nonrenewable?<br>4. What are the advantages of using renewable energy sources?<br>5. Do you think the U.S. has an obligation to reduce its use of nonrenewable energy sources? Why?<br>6. What future energy trends do you think are likely for the U.S.?<br>For more explicit teacher instructions visit<br>http://sfrc.ufl.edu/extension/ee/woodenergy/files/activities/WoodEnergy_activity1.pdf |

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| | After completing this Webquest, ask students to create a poster using the information they collected about energy in the U.S. The overarching topic of the poster can be open to students. For example, it could focus on renewable energy, impacts of energy on the environment, trends in U.S. energy consumption, or a comparison of U.S. energy consumption to other countries. Students should use graphics or pictures. Encourage students to draw or use magazine clippings or photos and to be as creative as possible. Students should also cite evidence and resources from the Web-quest in the poster text. Posters can be displayed around the classroom, lunchroom, or in school hallways. |
| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS3.A: Natural Resources<br>Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. |
| **Elaboration**<br>Extension Activity | Extension Activities:<br>Better Lessons (MS-ESS3-1)<br>Measuring Energy in the Atmosphere: Exploring Climate Change<br>What Are Fossil Fuels?<br>Blame it on the Carbon<br>Energy History<br>Why is Coal So Important?<br>Exploring Oil<br>What are We Coming Home To? |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Student Poster<br>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.<br>Following the WebQuest, students will use the information they gathered to create a poster. Student posters should include a scientific explanation which focuses on how the availability of nonrenewable energy resources has and continues to change.<br>See Rubric on pg. 4<br>http://sfrc.ufl.edu/extension/ee/woodenergy/files/activities/WoodEnergy_activity1.pdf |

| EARTH AND SPACE SCIENCE | | |
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| **MS-ESS3-2 Earth and Human Activity** | | |
| **MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.** | | |
| **Clarification Statement:** Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and without notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts). | | |
| **Assessment Boundary:** N/A | | |
| Evidence Statements: MS-ESS3-2 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Analyzing and Interpreting Data**<br>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.<br>Analyze and interpret data to determine similarities and differences in findings. | **ESS3.B: Natural Hazards**<br>Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. | **Patterns**<br>Graphs, charts, and images can be used to identify patterns in data.<br>**Connections to Engineering, Technology, and Applications of Science**<br>**Influence of Science, Engineering, and Technology on Society and the Natural World**<br>The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. |
| **Connections to other DCIs in this grade-band: MS.PS3.C** | | |
| **Articulation of DCIs across grade-bands: 3.ESS3.B ; 4.ESS3.B ; HS.ESS2.B ; HS.ESS2.D ; HS.ESS3.B ; HS.ESS3.D** | | |
| **NJSLS- ELA: RST.6-8.1, RST.6-8.7** | | |
| **NJSLS- Math: MP.2, 6.EE.B.6, 7.EE.B.4** | | |
| **5E Model** | | |
| **MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.** | | |

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| **Engage**<br>Anticipatory Set | Have students view series of National Geographic Videos on Catastrophic Events (volcanoes, hurricanes, tsunamis, tornadoes, and earthquakes.<br>http://video.nationalgeographic.com/video/environment<br>Lead classroom discussion on catastrophic events. Encourage students to share their previous understanding of and personal experiences with these events. |
| **Exploration**<br>Student Inquiry | Naturally Disastrous<br>In this lesson, students are introduced to natural disasters and learn the difference between natural hazards and natural disasters. They discover the many types of natural hazards—avalanche, earthquake, flood, forest fire, hurricane, landslide, thunderstorm, tornado, tsunami and volcano—as well as specific examples of natural disasters. Students also explore why understanding these natural hazards is important to survival on our planet.<br>https://www.teachengineering.org/view_lesson.php?url=collection/cub_/lessons/cub_natdis/cub_natdis_lesson01.xml<br><br>Save Our City<br>In this lesson, students learn about various natural hazards and specific methods engineers use to prevent these hazards from becoming natural disasters. They study a hypothetical map of an area covered with natural hazards and decide where to place natural disaster prevention devices by applying their critical thinking skills and an understanding of the causes of natural disasters.<br>https://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_natdis/cub_natdis_lesson01_activity1.xm |
| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS3.B: Natural Hazards<br>Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. |
| **Elaboration**<br>Extension Activity | Earthquake Hazards<br>http://betterlesson.com/lesson/629624/earthquake-hazards<br>In this activity, students will identify major seismic hazards and evaluate the effectiveness of various safety measures. |
| **Evaluation**<br>Assessment Tasks | Predicting Volcanic Eruptions: Exercise<br>Analyze and interpret data to determine similarities and differences in findings.<br>Students will apply their understanding of interpreting natural hazard data to forecast future catastrophic events. |

| EARTH AND SPACE SCIENCE | | |
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| **MS-ESS3-4 Earth and Human Activity** | | |
| **MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.** | | |
| **Clarification Statement:** Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes. | | |
| **Assessment Boundary:** N/A | | |
| Evidence Statements: MS-ESS3-4 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Engaging in Argument from Evidence**<br>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).<br>Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. | **ESS3.C: Human Impacts on Earth Systems**<br>Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. | **Cause and Effect**<br>Cause and effect relationships may be used to predict phenomena in natural or designed systems.<br>**Connections to Engineering, Technology, and Applications of Science**<br>**Influence of Science, Engineering, and Technology on Society and the Natural World**<br>All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.<br>**Connections to Nature of Science**<br>**Science Addresses Questions About the Natural and Material World**<br>Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. |
| **Connections to other DCIs in this grade-band: MS.LS2.A ; MS.LS4.D** | | |
| **Articulation of DCIs across grade-bands: 3.LS2.C ; 3.LS4.D ; 5.ESS3.C ; HS.LS2.A ; HS.LS2.C ; HS.LS4.C ; HS.LS4.D ; HS.ESS2.E ; HS.ESS3.A ; HS.ESS3.C** | | |
| **NJSLS- ELA: RST.6-8.1, WHST.6-8.1, WHST.6-8.9** | | |
| **NJSLS- Math: 6.RP.A.1, 7.RP.A.2, 6.EE.B.6, 7.EE.B.4** | | |

| 5E Model | |
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| MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. | |
| **Engage**<br>Anticipatory Set | Have students view the following videos then lead a class discussion on the rate of human population growth and the effect this is having on natural resources :<br>7 Billion: How Did We Get So Big So Fast?<br>http://www.npr.org/2011/10/31/141816460/visualizing-how-a-population-grows-to-7-billion<br>Are We Using Up More Than What Is Available?<br>http://www.theworldcounts.com/stories/consequences_of_depletion_of_natural_resources<br><br>Video: Sustainable Development within Environmental Limits<br>http://study.com/academy/lesson/sustainable-development-within-environmental-limits.html |
| **Exploration**<br>Student Inquiry | Why Do We Build Dams?<br>In this activity, students will be introduced to the concept of a dam and its potential benefits, which include water supply, electricity generation, flood control, recreation and irrigation. This lesson begins an ongoing classroom scenario in which student engineering teams working for the Splash Engineering firm design dams for a fictitious client, Thirsty County.<br>https://www.teachengineering.org/view_lesson.php?url=collection/cub_/lessons/cub_dams/cub_dams_lesson01.xml<br><br>How Much Water Do You Use?<br>In this activity, students will keep track of their own water usage for one week, gaining an understanding of how much water is used for various everyday activities. Students will then relate their own water usages to the average residents of imaginary Thirsty County, and calculate the necessary water capacity of a dam that would provide residential water to the community.<br>https://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_dams/cub_dams_lesson01_activity1.x<br>Following these activities, students will be asked to synthesize their understanding of this concept by constructing an argument that explains the connection between human population and the availability of natural resources. Students should refer to concrete examples from these activities in order to support their argument with evidence. |
| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS3.C: Human Impacts on Earth Systems<br>Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. |

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| **Elaboration**<br>Extension Activity | Related Activities<br>Earth Science Week: MS-ESS3-4<br>http://www.earthsciweek.org/ngss-performance-expectations/ms-ess3-4 |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Why Do We Build Dams? Proposal<br>Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.<br>After you have introduced the hypothetical Thirsty County scenario, divide the class into engineering teams of 2-3 students each, and ask each team to write a short proposal response to the municipality of Thirsty County to address the resident's' needs. Proposals should comment on the needs of the residents, some possible solutions (at least a Plan A and Plan B), and benefits/problems associated with each plan proposed. For example, students may write a statement that says their team will "address the resident's' needs by designing a dam that provides people with water during summer droughts, protects buildings from flash floods and storms, and produces hydropower as a clean energy alternative to coal-fired power plants. |

| EARTH AND SPACE SCIENCE | | |
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| **MS-ESS3-5 Earth and Human Activity** | | |
| **MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused [rise in global temperatures] climate change over the past century.** | | |
| **Clarification Statement:** Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures. | | |
| **Assessment Boundary:** N/A | | |
| Evidence Statements: MS-ESS3-5 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Asking Questions and Defining Problems**<br>Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.<br>Ask questions to identify and clarify evidence of an argument. | **ESS3.D: Global Climate Change**<br>Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. | **Stability and Change**<br>Stability might be disturbed either by sudden events or gradual changes that accumulate over time. |

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| **Connections to other DCIs in this grade-band: MS.PS3.A** | |
| **Articulation of DCIs across grade-bands: HS.PS3.B ; HS.PS4.B ; HS.ESS2.A ; HS.ESS2.D ; HS.ESS3.C ; HS.ESS3.D** | |
| **NJSLS- ELA: RST.6-8.1** | |
| **NJSLS- Math: MP.2, 6.EE.B.6, 7.EE.B.4** | |
| **5E Model** | |
| **MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.** | |
| **Engage**<br>Anticipatory Set | Show the trailer for the movie "Chasing Ice". Have students work in small groups or pairs to try and identify themes or ideas conveyed by the trailer.<br>https://chasingice.com/<br><br>Have students read the online National Geographic article "The Big Thaw". The article explores the issues around global warming and melting glaciers. View and discuss each photo from the photo gallery.<br>http://ngm.nationalgeographic.com/2007/06/big-thaw/big-thaw-text<br><br>Show students a graph of the increase in average temperature on Earth over the last few years. Have students examine the graph and make hypotheses about why the temperature has increased.<br>http://climate.nasa.gov/vital-signs/global-temperature/ |
| **Exploration**<br>Student Inquiry | Activity 1: Exploring Global Climate Change<br>Have students view the video Global Warming 101. After viewing the video, lead a brief discussion about the facts presented.<br>http://video.nationalgeographic.com/video/101-videos/global-warming-101.<br>Allow students to view the National Geographic site on Global Warming<br>http://environment.nationalgeographic.com/environment/global-warming/<br>Next, student will explore NASA's climate change website: On this site, students can view facts, explore interactive features, view videos, read articles related to climate change, providing them with a basis of understanding on this topic.<br>http://climate.nasa.gov/.<br>After exploring the site, direct students to NASA's whiteboard animation series. Guide students in viewing and discussion several of these video animations. Following each video, lead students in a discussion to assess their thoughts and reactions.<br>http://climate.nasa.gov/climate_resource_center/earthminute<br>Climate Hot Map<br>http://www.climatehotmap.org/index.html<br><br>Activity 2: Viewpoints on Global Warming |

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| | To expose students to opposing viewpoints on global warming, have students read the article: Is Global Warming Real? This article presents the five top arguments both for and against global warming.<br>http://www.conserve-energy-future.com/is-global-warming-real.php<br>After reading this article, have students complete the Venn-Diagram to answer the question: Has human activity caused the world's climate to change over the past 100 years? Have students discuss their completed diagrams. What were some of the similarities and differences among the completed Venn-Diagrams?<br>http://www-tc.pbs.org/now/classroom/globalvenn.pdf<br><br>Activity 3: Making Predictions About the Effects of Global Warming<br>With a basic understanding of the global climate change, students can now make predictions about the potential impact of global warming. Ask students to hypothesize about how the world's climate could change over the next 100 years if humans do not take action. Have students make predictions about the effects such climate changes could have on humans.<br>Have students explore NASA proposed solutions to climate change, specifically proposed energy innovations. In groups, have students visit the following website and select one of the innovations. Students should read the article on their chosen innovation and gather key facts. Have students share these facts through brief group presentations.<br>http://climate.nasa.gov/solutions/energy_innovations/ |
| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS3.D: Global Climate Change<br>Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. |
| **Elaboration**<br>Extension Activity | Global Warming Project (PBS)<br>http://www-tc.pbs.org/now/classroom/globalproject.pdf |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Question Debate<br>Ask questions to identify and clarify evidence of an argument.<br>Following Activity 2- Viewpoints on Global Warming, students will be asked to pick a position on the topic of global warming. Using the evidence they gathered for both positions on their Venn-Diagram, the students will then be asked to construct a series of questions that could be used in a class debate on the topic. The questions that the students formulate should be directed to those who identify with the opposing view. Students will be assessed on the quality of the questions they develop and their overall participation in the debate. |

| Unit 4: Overview |
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| Unit 4: Astronomy |
| **Grade: 6** |
| **Content Area: Earth and Space Science** |
| **Pacing: 20 Instructional Days** |
| **Student Learning Objectives (Performance Expectations)** |
| **MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.** |
| **MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.** |
| **MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.** |
| **Unit Summary** |
| This unit is broken down into three sub-ideas: the universe and its stars, Earth and the solar system, and the history of planet Earth. Students examine the Earth's place in relation to the solar system, the Milky Way galaxy, and the universe. There is a strong emphasis on a systems approach and using models of the solar system to explain the cyclical patterns of eclipses, tides, and seasons. There is also a strong connection to engineering through the instruments and technologies that have allowed us to explore the objects in our solar system and obtain the data that support the theories explaining the formation and evolution of the universe. Students examine geosciences data in order to understand the processes and events in Earth's history. The crosscutting concepts of patterns, scale, proportion, and quantity and systems and systems models provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in developing and using models and analyzing and interpreting data. Students are also expected to use these practices to demonstrate understanding of the core ideas. |
| **Technical Terms** |
| Solar system, Milky Way galaxy, cyclical patterns, eclipses,tides, seasons, geosciences data, geocentric system, heliocentric system, inertia, gravity, nuclear fusion, photosphere, chromosphere, solar wind, prominence, retrograde rotation, geosynchronous orbit, apparent magnitude, barred galaxy, central bulge, cepheid variable, galactic center, globular clusters, halo, luminosity |
| **Formative Assessment Measures** |
| *Part A: What pattern in the Earth–sun–moon system can be used to explain lunar phases, eclipses of the sun and moon, and seasons?* |
| Students who understand the concepts are able to:<br>Students will develop and use a physical, graphical, or conceptual model to describe patterns in the apparent motion of the sun, moon, and stars in the sky. |
| *Part B: What is the role of gravity in the motions within galaxies and the solar system?* |
| Students who understand the concepts are able to:<br>Students develop and use models to explain the relationship between the tilt of Earth's axis and seasons. |

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| *Part C: What are the scale properties of objects in the solar system?* | |
| <u>Students who understand the concepts are able to:</u><br>Analyze and interpret data to determine similarities and differences among objects in the solar system. | |
| **Interdisciplinary Connections** | |
| **NJSLS- ELA** | **NJSLS- Mathematics** |
| Cite specific textual evidence to support analysis of science and technical texts.(MS-ESS1-3) RST.6-8.1<br>Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).(MS-ESS1-3) RST.6-8.7<br>Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.(MS-ESS1-1),(MS-ESS1-2) SL.8.5 | Reason abstractly and quantitatively.(MS-ESS1-3) MP.2<br>Model with mathematics.(MS-ESS1-1),(MS-ESS1-2) MP.4<br>Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.(MS-ESS1-1),(MS-ESS1-2),(MS-ESS1-3) 6.RP.A.1<br>Recognize and represent proportional relationships between quantities.(MS-ESS1-1),(MS-ESS1-2),(MS-ESS1-3) 7.RP.A.2<br>Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.(MS-ESS1-2) 6.EE.B.6<br>Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.(MS-ESS1-2) 7.EE.B.6 |
| **Core Instructional Materials** | • Lab stations & other teacher made materials<br>• Nearpod<br>• Brain Pop<br>• Ed Puzzle |
| **Career Readiness, Life Literacies and Key Skills** | 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.<br>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). |
| **Computer Science and Design Thinking** | 8.2.8.ED.5: Explain the need for optimization in a design process.<br>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.<br>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. |

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

| EARTH AND SPACE SCIENCES | | |
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| **MS-ESS1-1 Earth's Place in the Universe** | | |
| **MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.** | | |
| **Clarification Statement:** Examples of models can be physical, graphical, or conceptual. | | |
| **Assessment Boundary:** N/A | | |
| Evidence Statements: MS-ESS1-1 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Developing and Using Models**<br>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.<br>Develop and use a model to describe phenomena. | **ESS1.A: The Universe and Its Stars**<br>Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.<br>**ESS1.B: Earth and the Solar System**<br>This model of the solar system can explain eclipses of the sun and the moon. Earth's spin | **Patterns**<br>Patterns can be used to identify cause-and-effect relationships.<br>**Connections to Nature of Science**<br>**Scientific Knowledge Assumes an Order and Consistency in Natural Systems** |

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| | axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. | Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. |

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

**Articulation of DCIs across grade-bands: 3.PS2.A ; 5.PS2.B ; 5.ESS1.B ; HS.PS2.A ; HS.PS2.B ; HS.ESS1.B**

**NJSLS- ELA: SL.8.5**

**NJSLS- Math: MP.4, 6.RP.A.1, 7.RP.A.2**

**MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.**

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| **Engage**<br>Anticipatory Set | Begin by having students view the following video series:<br>http://www.visuallearningsys.com/digital-science/preview.<br>This series will provide students with an introduction to the Earth-sun-moon system by discussing the following topics: Planet Earth, Earth in Space, The Sun, Earth's Moon, Phases of the Moon, Eclipses and Tides.<br>Provide students with the worksheet Video Review from the following learning guide to complete as they watch the video series (p. 18).<br>http://s3.amazonaws.com/VLCmedia/Digital_Science_Preview/Guide/Exploring_Earth_Sun_and_Moon_Guide.pdf.<br>Following the videos, review the post-video questions from the Video Review worksheet as a class. |
| **Exploration**<br>Student Inquiry | To begin the lesson, have students view the following animations: These short animations provide visual representations of the following topics: Gravity, Lunar Eclipses, Phases of the Moon, Size of Earth to Sun, Size of Moon to Earth, Solar Eclipses and Tides.<br>http://www.visuallearningsys.com/digital-science/preview<br>Lab Activity: Moon Phases and Eclipses<br>Use the following resources to guide students through a series of lab activities.<br>http://www.myips.org/cms/lib8/IN01906626/Centricity/Domain/8123/Moon.pdf<br>Lab Activity 1: What do You Think Causes the Phases of the Moon?<br>Lab Activity 2: Modeling the Phases of the Moon<br>Lab Activity 3: Determining which way the moon revolves around Earth<br>Lab Activity 4: Synthesizing Your Understanding of the Phases of the Moon<br>Lab Activity 5: Why Do We Always See the Same Side of the Moon?<br>Lab Activity 6: What Causes Solar and Lunar Eclipses?<br>Lab Activity 7: Why Don't We Have Solar and Lunar Eclipses Every Month? |

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| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS1.A: The Universe and Its Stars<br>Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.<br>ESS1.B: Earth and the Solar System<br>This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. |
| **Elaboration**<br>Extension Activity | Phases of the Moon: In this activity, students will create a model to show how the regular motions of the Moon because Moon phases.<br>http://betterlesson.com/lesson/636034/phases-of-the-moon |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Post-Lab Reflection Questions (Activities 1-7)<br>Assessment Task B: Model Evaluation & Reflection<br>Develop and use a model to describe phenomena.<br>Once students have made their models and reviewed them with the teacher, ask them to reflect on the accuracy of their model. Ask them to write a paragraph that compares the theory the developed in Lab Activity 1 to the actual arrangement of the sun, moon and Earth to create the phases of the moon, eclipses. and the seasons. What was similar? What was different? Were they surprised by the outcome? Did it bring up any questions? Ask students to hold a discussion with their partner before drafting the final paragraph. |

| EARTH AND SPACE SCIENCES |
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| **MS-ESS1-2 Earth's Place in the Universe** |
| **MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.** |
| **Clarification Statement:** Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state). |
| **Assessment Boundary:** Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth. |
| Evidence Statements: MS-ESS1-2 |

| Science & Engineering Practices | Disciplinary Core Ideas | Cross-Cutting Concepts |
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| **Developing and Using Models**<br>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.<br>Develop and use a model to describe phenomena. | **ESS1.A: The Universe and Its Stars**<br>Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.<br>**ESS1.B: Earth and the Solar System**<br>The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.<br>The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. | **Systems and System Models**<br>Models can be used to represent systems and their interactions.<br>**Connections to Nature of Science**<br>**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**<br>Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. |

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

**Articulation of DCIs across grade-bands: 3.PS2.A ; 5.PS2.B ; 5.ESS1.A ; 5.ESS1.B ; HS.PS2.A ; HS.PS2.B ; HS.ESS1.A ; HS.ESS1.B**

**NJSLS- ELA: SL.8.5**

**NJSLS- Math: MP.4, 6.RP.A.1, 7.RP.A.2, 6.EE.B.6, 7.EE.B.6**

## 5E Model

**MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.**

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| **Engage**<br>Anticipatory Set | The following link provides introductory resources on the topic including videos and discussion questions.<br>Gravity in the Solar System |
| **Exploration**<br>Student Inquiry | Students will make a 3D model of gravity. The following website provides a full lesson plan and explanation of procedures. Group students into small groups. Have the following supplies for each group: hula hoop, approximately 1m2 (depends on size of hula hoop) of stretchy Lycra material (or a garbage bags), Bulldog clips, a rock and three or four balls (marble, golf ball, ping pong ball)<br>The Pull of the Planets<br><br>Following the activity, each group will be assigned a common misconception about gravity. Students will use research material to explain the misconceptions.<br>When Gravity Gets You Down |

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| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS1.A: The Universe and Its Stars<br>Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.<br>ESS1.B: Earth and the Solar System<br>The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.<br>The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. |
| **Elaboration**<br>Extension Activity | Additional Activities: Better Lessons<br>MS-ESS1-2 |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Model Creation<br>Develop and use a model to describe phenomena.<br>Students will create models that conclude that based on the mass and distance of the object (planet, comet, asteroid, meteoroid, etc...), the object's gravitational force is proportional. Within the explanation of the model, students will conclude that the orbital motion is caused by gravity. Develop a rubric to assess the above criteria. |

| EARTH AND SPACE SCIENCES | | |
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| **MS-ESS1-3 Earth's Place in the Universe** | | |
| **MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.** | | |
| **Clarification Statement:** Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models. | | |
| **Assessment Boundary:** Assessment does not include recalling facts about properties of the planets and other solar system bodies. | | |
| Evidence Statements: MS-ESS1-3 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Analyzing and Interpreting Data**<br>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.<br>Analyze and interpret data to determine similarities and differences in findings. | **ESS1.B: Earth and the Solar System**<br>The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. | **Scale, Proportion, and Quantity**<br>Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.<br>**Connections to Engineering, Technology, and Applications of Science**<br>**Interdependence of Science, Engineering, and Technology**<br>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: MS.ESS2.A** | | |
| **Articulation of DCIs across grade-bands: 5.ESS1.B ; HS.ESS1.B ; HS.ESS2.A** | | |
| **NJSLS- ELA: RST.6-8.1, RST.6-8.7** | | |
| **NJSLS- Math: MP.2, 6.RP.A.1, 7.RP.A.2** | | |

| 5E Model | |
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| **MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.** | |
| **Engage**<br>Anticipatory Set | Begin lesson by asking students to draw a diagram of the solar system in and label all items. Remind students that they can use only one sheet of paper. 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 the size and distance of objects. |

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| **Exploration**<br>Student<br>Inquiry | Explain that all the images we know of the solar system are not to scale. In order to create a true model of the solar system, a much bigger is needed. Have students view the video: A Scale Model of the Solar System<br>http://digg.com/video/scale-model-solar-system<br>Distance Between Objects<br>http://joshworth.com/dev/pixelspace/pixelspace_solarsystem.html<br>Create a worksheet or chart on which student will record the distance from the sun for each planet. After completing the worksheet, create questions which require the student to analyze and interpret the data they recorded on the distance between these solar system objects.<br><br>Size and Distance Comparison<br>http://education.nationalgeographic.com/activity/planetary-size-and-distance-comparison/<br><br>Culminating Activity<br>After having viewed and analyzed the data presented in these resources, have students work independently to summarize, in writing, what they learned about our solar system, including:<br>- locations of planets in relation to the sun and one another<br>- relative sizes of planets, including Earth<br>- relative distances of planets<br>- any conclusions they can draw about the locations of the asteroid belt and Kuiper belt |
| **Explanation**<br>Concepts and<br>Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS1.B: Earth and the Solar System<br>The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. |
| **Elaboration**<br>Extension<br>Activity | Have student explore the following site: Build a Solar System Model. This website provides digital tools to determine accurate size and distance between the objects in our solar system, assisting students in creating an accurate model.<br>http://www.exploratorium.edu/ronh/solar_system/ |
| **Evaluation**<br>Assessment<br>Tasks | Assessment Task A: Planetary Size Comparison Chart<br>http://media.education.nationalgeographic.com/assets/file/Planetary_Size_Comparison_Worksheet.pdf<br><br>Assessment Task B: Stepping Out in the Solar System<br>http://media.education.nationalgeographic.com/assets/file/Stepping_Out_the_Solar_System_Worksheet.pdf |

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| | Assessment Task C: Analysis & Interpretation of Data<br>Analyze and interpret data to determine similarities and differences in findings.<br>Have students work independently to summarize, in writing, what they learned about our solar system, including:<br>- locations of planets in relation to the sun and one another<br>- relative sizes of planets, including Earth<br>- relative distances of planets<br>- any conclusions they can draw about the locations of the asteroid belt and Kuiper belt |

| Unit 5: Overview |
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| Unit 5: Earth Systems |
| **Grade: 6** |
| **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: |

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| Construct a scientific explanation based on valid and reliable evidence from rock strata obtained from sources (including the students' own experiments).<br>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?* |
| <u>Students who understand the concepts are able to:</u><br>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?* |
| <u>Students who understand the concepts are able to:</u><br>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).<br>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.<br>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).<br>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?* |
| <u>Students who understand the concepts are able to:</u> |
| 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** | |
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| **NJSLS- ELA** | **NJSLS- Mathematics** |
| Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-4),(MS-ESS2-2)RST.6-8.1<br>Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS1-4),(MS-ESS2-2)WHST.6-8.2 | Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS2-2),(MS-ESS2-3) 7.EE.B.4<br>Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an |

<table>
<tr><td colspan="2">Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS2-3) RST.6-8.7<br>Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-3) RST.6-8.9<br>Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-1),(MS-ESS2-2) SL.8.5</td><td>unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-4),(MS-ESS2-2),(MS-ESS2-3) 6.EE.B.6<br>Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS1-4) 7.EE.B.6<br>Reason abstractly and quantitatively. (MS-ESS2-2),(MS-ESS2-3) MP.2</td></tr>
<tr><td>Core Instructional Materials</td><td colspan="2">● Lab stations<br>● Teacher made materials<br>● Nearpod<br>● Brain Pop<br>● Blooket<br>● Ed puzzle</td></tr>
<tr><td>Career Readiness, Life Literacies and Key Skills</td><td colspan="2">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).<br>9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3).<br>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).<br>9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.<br>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).<br>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).<br>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.<br>9.4.8.DC.1: Analyze the resource citations in online materials for proper use.<br>9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8).</td></tr>
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| | 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).<br>9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.<br>9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.<br>9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.<br>9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data.<br>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).<br>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)<br>9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.<br>9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making<br>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).<br>9.4.8.TL.3: Select appropriate tools to organize and present information digitally.<br>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).<br>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.<br>8.1.8.DA.6: Analyze climate change computational models and propose refinements.<br>8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.<br>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).<br>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.<br>8.2.8.ED.5: Explain the need for optimization in a design process.<br>8.2.8.ED.6: Analyze how trade-offs can impact the design of a product.<br>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). |

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| | 8.2.8.ITH.2: Compare how technologies have influenced society over time.<br>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.<br>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.<br>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.<br>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).<br>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.<br>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** | | | | |
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| **English Language Learners** | **Special Education** | **At-Risk** | **Gifted and Talented** | **504** |
| Scaffolding<br>Word walls<br>Sentence/paragraph frames<br>Bilingual dictionaries/translation<br>Think alouds<br>Read alouds<br>Highlight key vocabulary<br>Annotation guides<br>Think-pair- share<br>Visual aides<br>Modeling<br>Cognates | Word walls<br>Visual aides<br>Graphic organizers<br>Multimedia<br>Leveled readers<br>Assistive technology<br>Notes/summaries<br>Extended time<br>Answer masking<br>Answer eliminator<br>Highlighter<br>Color contrast | Teacher tutoring<br>Peer tutoring<br>Study guides<br>Graphic organizers<br>Extended time<br>Parent communication<br>Modified assignments<br>Counseling | Curriculum compacting<br>Challenge assignments<br>Enrichment activities<br>Tiered activities<br>Independent research/inquiry<br>Collaborative teamwork<br>Higher level questioning<br>Critical/Analytical thinking tasks<br>Self-directed activities | Word walls<br>Visual aides<br>Graphic organizers<br>Multimedia<br>Leveled readers<br>Assistive technology<br>Notes/summaries<br>Extended time<br>Answer masking<br>Answer eliminator<br>Highlighter<br>Color contrast<br>Parent communication<br>Modified assignments<br>Counseling |

<table>
<tr><th colspan="3">EARTH AND SPACE SCIENCES</th></tr>
<tr><td colspan="3">MS-ESS1-4 Earth's Place in the Universe</td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td colspan="3">Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.</td></tr>
<tr><td colspan="3">Evidence Statements: MS-ESS1-4</td></tr>
<tr><th>Science & Engineering Practices</th><th>Disciplinary Core Ideas</th><th>Cross-Cutting Concepts</th></tr>
<tr><td>Constructing Explanations and Designing Solutions<br>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.<br>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.</td><td>ESS1.C: The History of Planet Earth<br>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.</td><td>Scale, Proportion, and Quantity<br>Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.</td></tr>
<tr><td colspan="3">Connections to other DCIs in this grade-band: MS.LS4.A ; MS.LS4.C</td></tr>
<tr><td colspan="3">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</td></tr>
<tr><td colspan="3">NJSLS- ELA: RST.6-8.1, WHST.6-8.2</td></tr>
<tr><td colspan="3">NJSLS- Math: 6.EE.B.6, 7.EE.B.6</td></tr>
<tr><th colspan="3">5E Model</th></tr>
<tr><td colspan="3">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.</td></tr>
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| **Engage**<br>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.<br>Geologic Time Scale: Video and Quiz<br>http://study.com/academy/lesson/geologic-time-scale-major-eons-eras-periods-and-epochs.html |
| **Exploration**<br>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.<br>http://geoinfo.nmt.edu/education/exercises/PopcornDating/home.html<br><br>Geological Time Project<br>In this multi-day project, student will explore how Earth's rocks and other materials provide a record of its history.<br>http://betterlesson.com/lesson/637351/geologic-time-mini-project |
| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS1.C: The History of Planet Earth<br>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**<br>Extension Activity | Biostratigraphy<br>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.<br>https://gtm-media.discoveryeducation.com/videos/DSC/data/ESS_TX_GeologicTimeScale_HOL_Biostratigraphy.pdf |

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| **Evaluation**<br>Assessment Tasks | Assessment Task A: (Dating Popcorn activity)<br>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.<br>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?<br><br>Assessment Task B: Geological Time Data Sheet<br>https://docs.google.com/document/d/12dNUjd6aiwodMKt42OZyV4tVr1joD3JlzjgB2JvkPfo/edit<br><br>Assessment Task C: Geological Time Interactive Poster<br>Use the following Poster Rubric<br>http://betterlesson.com/lesson/resource/3297665/rubric-geologic-time-interactive-poster?from=resource_image |

<table>
<tr><th colspan="3">EARTH AND SPACE SCIENCE</th></tr>
<tr><td colspan="3">MS-ESS2-1 Earth's Systems</td></tr>
<tr><td colspan="3">MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.</td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td colspan="3">Assessment Boundary: Assessment does not include the identification and naming of minerals.</td></tr>
<tr><td colspan="3">Evidence Statements: MS-ESS2-1</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<br>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.</td><td>ESS2.A: Earth's Materials and Systems<br>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</td><td>Stability and Change<br>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.</td></tr>
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| Develop and use a model to describe phenomena. | matter that cycles produce chemical and physical changes in Earth's materials and living organisms. | |

**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**

**NJSLS- ELA: SL.8.5**

**NJSLS- Math: N/A**

## 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.**

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| **Engage**<br>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.<br>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.<br>https://www.khanacademy.org/partner-content/mit-k12/mit-k12-biology/v/rock-cycle (Grade level videos- also covers the flow of energy)<br>http://studyjams.scholastic.com/studyjams/jams/science/rocks-minerals-landforms/rock-cycle.htm<br>https://www.youtube.com/watch?v=uAAeFB7Tv5A |

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| **Exploration**<br>Student Inquiry | Present the online PowerPoint: Energy in the Rock Cycle<br>http://www.uen.org/Lessonplan/downloadFile.cgi?file=36937-2-43128-EnergyinCyclePPT_.pptx&filename=EnergyinCyclePPT_.pptx<br><br>Ride the Rock Cycle<br>http://teacherstryscience.org/lp/ride-rock-cycle<br>In this multi day lesson, students will:<br>Participate in a kinesthetic activity related to the rock cycle<br>Compare/ contrast representations of data<br>Design their own simulation of the rock cycle<br><br>Activity 1: Ride the Rock Cycle<br>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.<br><br>Activity 4: Design & Simulation Task<br>Students will explore the environmental factors that can affect rocks including erosion/weathering, deposition, cementation/ compaction, heating, pressure, and cooling. |
| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS2.A: Earth's Materials and Systems<br>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**<br>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.<br>Rock Cycle Roundabout<br>http://www.calacademy.org/educators/lesson-plans/rock-cycle-roundabout |

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| **Evaluation**<br>Assessment Tasks | Assessment Task A: Ride the Rock Cycle- Comic Strip<br>Student Worksheets and Rubrics<br><br>Assessment Task B: Environmental Factors Rubric<br>Develop and use a model to describe phenomena.<br>Student Worksheets and Rubrics |

<table>
<tr><th colspan="3">EARTH AND SPACE SCIENCE</th></tr>
<tr><td colspan="3">MS-ESS2-2 Earth's Systems</td></tr>
<tr><td colspan="3">MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.</td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td colspan="3">Assessment Boundary: N/A</td></tr>
<tr><td colspan="3">Evidence Statements: MS-ESS2-2</td></tr>
<tr><th>Science & Engineering Practices</th><th>Disciplinary Core Ideas</th><th>Cross-Cutting Concepts</th></tr>
<tr><td>Constructing Explanations and Designing Solutions<br>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.<br>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.</td><td>ESS2.A: Earth’s Materials and Systems<br>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.<br>ESS2.C: The Roles of Water in Earth's Surface Processes<br>Water’s movements—both on the land and underground—cause weathering and erosion, which change the land’s surface features and create underground formations.</td><td>Scale Proportion and Quantity<br>Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.</td></tr>
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| **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** | |
| **NJSLS- ELA: RST.6-8.1, WHST.6-8.2, SL.8.5** | |
| **NJSLS- Math: MP.2, 6.EE.B.6, 7.EE.B.4** | |
| **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**<br>Anticipatory Set | Weather and Erosion Introduction Activity:<br>http://www.scoe.net/slypark/pdf/Pre_Sly_Park-Shaping_Earth's_Surface_Activity.pdf<br>Plate Tectonics Video:<br>http://education.nationalgeographic.org/media/plate-tectonics/ |
| **Exploration**<br>Student Inquiry | Geological Timeline: Discovery<br>The purpose of this lesson is to introduce students to the features of geologic timelines.<br>http://betterlesson.com/lesson/637787/geologic-timeline-discovery<br>Convection Current<br>http://betterlesson.com/lesson/633215/convection-currents<br>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.<br>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.<br>Have students construct an explanation to the following questions. Explanations should be based on evidence they gained from the activity,<br>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?<br>What happens as the mantle is heated?<br>What happens as it becomes less dense?<br>What happens to the mantle as the heated material rises?<br>We call the circular motion created by the heating and cooling of fluids a convection current.<br>How might this convection current cause tectonic plate movement? |

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| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS2.A: Earth's Materials and Systems<br>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.<br>ESS2.C: The Roles of Water in Earth's Surface Processes<br>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**<br>Extension Activity | Related Activities<br>Earth Science Week MS-ESS2-2<br>http://www.earthsciweek.org/ngss-performance-expectations/ms-ess2-2 |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Constructed-Responses<br>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 | | |
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| **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**<br>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. | **ESS1.C: The History of Planet Earth**<br>Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE),(secondary)<br>**ESS2.B: Plate Tectonics and Large-Scale System Interactions** | **Patterns**<br>Patterns in rates of change and other numerical relationships can provide information about natural systems. |

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| Analyze and interpret data to determine similarities and differences in findings.<br>**Connections to Nature of Science**<br>**Scientific Knowledge is Open to Revision in Light of New Evidence**<br>Science findings are frequently revised and/or reinterpreted based on new evidence. | 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. | |

**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**

**NJSLS- ELA: RST.6-8.1, RST.6-8.7, RST.6-8.9**

**NJSLS- Math: MP.2, 6.EE.B.6, 7.EE.B.4**

**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.**

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| **Engage**<br>Anticipatory Set | Fossil Evidence of Plate Tectonics<br>https://prezi.com/plwzjedxstfi/fossil-evidence-of-plate-tectonics/ |
| **Exploration**<br>Student Inquiry | The Theory of Plate Tectonics<br>In this activity, students will gather evidence to explain the theory of plate tectonics.<br>https://www.teachengineering.org/collection/csm_/activities/csm_platetectonics/csm_platetectonics_activity1_worksheet_v3_tedl_dwc.pdf<br>Pangaea- Wegener's Puzzling Evidence<br>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.<br>http://betterlesson.com/lesson/635197/pangaea-wegener-s-puzzling-evidence |

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| **Explanation**<br>Concepts and Practices | In these lessons<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>ESS1.C: The History of Planet Earth<br>Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE),(secondary)<br>ESS2.B: Plate Tectonics and Large-Scale System Interactions<br>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**<br>Extension Activity | Plate Tectonics Puzzle<br>American Museum of Natural History: Plate Tectonic Puzzle |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Theory of Plate Tectonics- Position Paper<br>Analyze and interpret data to determine similarities and differences in findings.<br>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.<br><br>Assessment Task B: Pangaea - Wegener's Puzzling Evidence- Position Paper<br>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. |

| Unit 6: Overview |
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| Unit 6: Matter and Energy in Organisms and Ecosystems |
| **Grade: 6** |
| **Content Area: Life Science** |
| **Pacing: 25 Instructional Days** |
| **Essential Question** |
| How and why do organisms interact with their environment and what are the effects of these interactions? |
| **Student Learning Objectives (Performance Expectations)** |
| **MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.** |
| **MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.** |
| **MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.** |
| **Unit Summary** |
| Students analyze and interpret data, develop models, construct arguments, and demonstrate a deeper understanding of the cycling of matter, the flow of energy, and resources in ecosystems. They are able to study patterns of interactions among organisms within an ecosystem. They consider biotic and abiotic factors in an ecosystem and the effects these factors have on populations. They also understand that the limits of resources influence the growth of organisms and populations, which may result in competition for those limited resources. The crosscutting concepts of matter and energy, systems and system models, patterns, and cause and effect provide a framework for understanding the disciplinary core ideas. Students demonstrate grade-appropriate proficiency in analyzing and interpret data, developing models, and constructing arguments. Students are also expected to use these practices to demonstrate understanding of the core ideas. |
| **Technical Terms** |
| Cycling of Matter, flow of energy, ecosystems, biome, biotic, abiotic, producers, consumers, decomposers, symbiosis, carbon cycle |
| **Formative Assessment Measures** |
| *Part A: How do changes in the availability of matter and energy affect populations in an ecosystem?* |
| Students who understand the concepts are able to:<br>Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.<br>Use cause-and-effect relationships to predict the effect of resource availability on organisms and populations in natural systems. |
| *Part B: How do relationships among organisms, in an ecosystem, affect populations?* |
| Students who understand the concepts are able to:<br>Construct an explanation about interactions within ecosystems. |

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| Include qualitative or quantitative relationships between variables as part of explanations about interactions within ecosystems.<br>Make predictions about the impact within and across ecosystems of competitive, predatory, or mutually beneficial relationships as abiotic (e.g., floods, habitat loss) or biotic (e.g., predation) components change. |

| **Interdisciplinary Connections** | |
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| **NJSLS- ELA** | **NJSLS- Mathematics** |
| Cite specific textual evidence to support analysis of science and technical texts.(MS-LS2-1),(MS-LS2-2) RST.6-8.1<br>Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).(MS-LS2-1) RST.6-8.7<br>Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.(MS-LS2-2) WHST.6-8.2<br>Draw evidence from literary or informational texts to support analysis, reflection, and research.(MS-LS2-2) WHST.6-8.9<br>Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.(MS-LS2-2) SL.8.1<br>Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.(MS-LS2-2) SL.8.4<br>Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.(MS-LS2-3) SL.8.5 | Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.(MS-LS2-3) 6.EE.C.9<br>Summarize numerical data sets in relation to their context.(MS-LS2-2) 6.SP.B.5 |

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| **Core Instructional Materials** | • Lab stations and other teacher made materials<br>• Brain pop<br>• Ed puzzle<br>• Blooket<br>• Kahoot<br>• Quizizz<br>• Nearpod |

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| **Career Readiness, Life Literacies and Key Skills** | 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.<br>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).<br>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). |
| **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.<br>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).<br>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. |

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

| LIFE SCIENCE | | |
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| **MS-LS2-1 Ecosystems: Interactions, Energy, and Dynamics** | | |
| **MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.** | | |
| **Clarification Statement:** Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources. | | |
| **Assessment Boundary:** N/A | | |
| Evidence Statements: MS-LS2-1 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Analyzing and Interpreting Data**<br>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.<br>Analyze and interpret data to provide evidence for phenomena. | **LS2.A: Interdependent Relationships in Ecosystems**<br>Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.<br>In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.<br>Growth of organisms and population increases are limited by access to resources. | **Cause and Effect**<br>Cause and effect relationships may be used to predict phenomena in natural or designed systems. |
| **Connections to other DCIs in this grade-band: MS.ESS3.A ; MS.ESS3.C** | | |
| **Articulation of DCIs across grade-bands: 3.LS2.C ; 3.LS4.D ; 5.LS2.A ; HS.LS2.A ; HS.LS4.C ; HS.LS4.D ; HS.ESS3.A** | | |
| **NJSLS- ELA: RST.6-8.1, RST.6-8.7** | | |
| **NJSLS- Math: N/A** | | |

| 5E Model | |
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| **MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.** | |
| **Engage**<br>Anticipatory Set | http://www.ck12.org/ngss/middle-school-life-sciences/ecosystems:-interactions,-energy,-and-dynamics<br>Open Limiting Factors to Population Growth Tab<br>Click Video: Populations' Biotic Potential |

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| **Exploration**<br>Student Inquiry | Rat Attack- Interactive Population Activity<br>In this lesson, students will<br>- understand that an ecosystem encompasses both biotic (organisms) and abiotic components (such as light, nutrients, and moisture).<br>- describe the interactions among the components of one forest ecosystem.<br>- predict how a forest ecosystem might change when a resource pulse occurs.<br>http://www.pbs.org/wgbh/nova/education/activities/3603_rats.html<br>Exploring Resource Availability and Population Size<br>In this lesson, students will analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.<br>http://betterlesson.com/lesson/639457/exploring-resource-availability-and-population-size |
| **Explanation**<br>Concepts and Practices | In these lessons:<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas):<br>LS2.A: Interdependent Relationships in Ecosystems<br>Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.<br>In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.<br>Growth of organisms and population increases are limited by access to resources. |
| **Elaboration**<br>Extension Activity | RiverVenture: Population Study Game<br>http://www.riverventure.org/charleston/resources/pdf/population%20study%20game.pdf |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Narrative (Rat Attack Activity)<br>Have the new teams combine organism stories and put together a comprehensive narrative of what happened with the entire forest ecosystem over the two years, including the outcome of each organism at the end of each year.<br>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.<br>Assessment Task B: Collaborative Group Discussion Questions (Exploring Resources Activity)<br>Student responses will indicate their ability to analyze and interpret given data.<br>Analyze and interpret data to provide evidence for phenomena. |

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| | Assessment Task C: Exit Slips (Exploring Resources Activity)<br>Students will complete an Exit Slip which requires them to construct a scientific explanation addressing the relationship between resource availability and population dynamics. |

| LIFE SCIENCE | | |
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| **MS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics** | | |
| **MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.** | | |
| **Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.** | | |
| **Assessment Boundary: N/A** | | |
| Evidence Statements: MS-LS2-2 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Constructing Explanations and Designing Solutions**<br>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.<br>Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. | **LS2.A: Interdependent Relationships in Ecosystems**<br>Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. | **Patterns**<br>Patterns can be used to identify cause and effect relationships. |

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| **Connections to other DCIs in this grade-band: MS.LS1.B** | |
| **Articulation of DCIs across grade-bands: 1.LS1.B ; HS.LS2.A ; HS.LS2.B ; HS.LS2.D** | |
| **CCSS- ELA: RST.6-8.1, WHST.6-8.2, WHST.6-8.9, SL.8.1, SL.8.4** | |
| **CCSS- Math: 6.SP.B.5** | |
| **5E Model** | |
| **MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.** | |
| **Engage**<br>Anticipatory Set | Videos: http://www.ck12.org/ngss/middle-school-life-sciences/ecosystems:-interactions,-energy,-and-dynamics<br>Competition, Predation, and Symbiosis (separate videos as part of explanation)<br>Symbiosis: A Surprising Tale of Species Cooperation |
| **Exploration**<br>Student Inquiry | In groups, students will create a digital presentation (PPT, Google Slides etc.) for an assigned biome. Each student will be responsible to contributing to the presentation by creating at least one slide on one of the following factors of their biome: abiotic and biotic factors, food chain and web, land features, organisms, cycles, etc. The following websites can be used for student research:<br>http://kids.nceas.ucsb.edu/biomes/<br>http://www.blueplanetbiomes.org/world_biomes.htm<br>http://earthobservatory.nasa.gov/Experiments/Biome/<br>The following are short video clips:<br>http://www.pbslearningmedia.org/resource/tdc02.sci.life.eco.arctic/arctic-tundra/<br>http://www.pbslearningmedia.org/resource/tdc02.sci.life.eco.desert/desert-biome/<br>http://www.pbslearningmedia.org/resource/tdc02.sci.life.oate.rainforest/amazon-rainforest/<br>Following the group presentations, guide students in predicting the patterns of interaction that were presented in each biome by asking the following questions:<br>1. What competitive interactions did you see?<br>2. What predatory interactions did you see?<br>3. What symbiotic interactions did you see?<br>4. Which interactions were mutually beneficial to more than one organism? |
| **Explanation**<br>Concepts and Practices | In these lessons:<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): |

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| | LS2.A: Interdependent Relationships in Ecosystems<br>Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. |
| **Elaboration**<br>Extension Activity | Related Activities<br>http://www.ck12.org/ngss/middle-school-life-sciences/ecosystems:-interactions,-energy,-and-dynamics |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Group Presentation Response Questions<br>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.<br>Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. |

| LIFE SCIENCE |
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| **MS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics** |
| **MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.** |
| **Clarification Statement:** Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system. |
| **Assessment Boundary:** Assessment does not include the use of chemical reactions to describe the processes. |
| Evidence Statements: MS-LS2-3 |

| Science & Engineering Practices | Disciplinary Core Ideas | Cross-Cutting Concepts |
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| **Developing and Using Models**<br>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.<br>Develop a model to describe phenomena. | **LS2.B: Cycle of Matter and Energy Transfer in Ecosystems**<br>Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. | **Energy and Matter**<br>The transfer of energy can be tracked as energy flows through a natural system.<br>**Connections to Nature of Science**<br>**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**<br>Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. |
| **Connections to other DCIs in this grade-band: MS.PS1.B** | | |
| **Articulation of DCIs across grade-bands: 5.LS2.A ; 5.LS2.B ; HS.PS3.B ; HS.LS1.C ; HS.LS2.B ; HS.ESS2.A** | | |
| **NJSLS- ELA: SL.8.5** | | |
| **NJSLS- Math: 6.EE.C.9** | | |
| **5E Model** | | |
| **MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.** | | |
| **Engage**<br>Anticipatory Set | Video and Activities<br>http://betterlesson.com/lesson/639248/biotic-and-abiotic-factors | |
| **Exploration**<br>Student Inquiry | Carbon Cycle Role Play<br>https://www.calacademy.org/educators/lesson-plans/carbon-cycle-role-play<br>Role Play Cards: http://www.calacademy.org:8080/sites/default/files/assets/docs/pdf/048s1_carboncycledemocards.pdf<br>Lesson Plan: http://www.calacademy.org:8080/sites/default/files/assets/docs/pdf/048_carboncycleroleplayredesign10nov2014mks.pdf | |

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| **Explanation**<br>Concepts and Practices | In these lessons:<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas):<br>LS2.B: Cycle of Matter and Energy Transfer in Ecosystems<br>Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. |
| **Elaboration**<br>Extension Activity | Meadowlands Environmental Center<br>http://mec.rst2.edu/environment/ |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Discussion- Human Impacts on the Carbon Cycle (Part of Carbon Cycle Role Play lesson plan)<br>Lead a class discussion to assess student understanding of human impact on the carbon cycle.<br>Assessment Task B: Carbon Cycle Poster<br>https://www.calacademy.org/educators/lesson-plans/carbon-cycle-poster<br>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. |

| Unit 7: Overview |
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| **Unit 7: Interdependent Relationships in Ecosystems** |
| **Grade: 6** |
| **Content Area: Life Science** |
| **Pacing: 25 Instructional Days** |
| **Essential Question** |
| What happens to ecosystems when the environment changes? |
| **Student Learning Objectives (Performance Expectations)** |
| **MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.** |
| **MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.** |
| **MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.** |
| **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 build on their understandings of the transfer of matter and energy as they study patterns of interactions among organisms within an ecosystem. They consider biotic and abiotic factors in an ecosystem and the effects these factors have on a population. They construct explanations for the interactions in ecosystems and the scientific, economic, political, and social justifications used in making decisions about maintaining biodiversity in ecosystems. The crosscutting concept of stability and change provide a framework for understanding the disciplinary core ideas. This unit includes a two-stage engineering design process. Students first evaluate different engineering ideas that have been proposed using a systematic method, such as a tradeoff matrix, to determine which solutions are most promising. They then test different solutions, and combine the best ideas into a new solution that may be better than any of the preliminary ideas. Students demonstrate grade appropriate proficiency in asking questions, designing solutions, engaging in argument from evidence, developing and using models, and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas. |
| **Technical Terms** |
| Biodiversity, scientific justification ,habitat, niches, herbivore, carnivore, omnivore, energy pyramid, food chain |
| **Formative Assessment Measures** |
| *Part A: How can a single change to an ecosystem disrupt the whole system?* |
| Students who understand the concepts are able to:<br>Construct an argument to support or refute an explanation for the changes to populations in an ecosystem caused by disruptions to a physical or biological component of that ecosystem. Empirical evidence and scientific reasoning must support the argument. |

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| Use scientific rules for obtaining and evaluating empirical evidence.<br>Recognize patterns in data and make warranted inferences about changes in populations.<br>Evaluate empirical evidence supporting arguments about changes to ecosystems. |
| *Part B: What limits the number and variety of living things in an ecosystem?* |
| <u>Students who understand the concepts are able to:</u><br>Construct a convincing argument that supports or refutes claims for solutions about the natural and designed world(s).<br>Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs.<br>Create design criteria for design solutions for maintaining biodiversity and ecosystem services.<br>Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. |

| **Interdisciplinary Connections** | |
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| **NJSLS- ELA** | **NJSLS- Mathematics** |
| Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-4) RST.6-8.1<br>Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5) RST.6-8.8<br>Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS2-5) RI.8.8<br>Write arguments to support claims with clear reasons and relevant evidence. (MS-LS2-4),(MS-ETS1-1),(MS-ETS1-3) WHST.6-8.1<br>Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS2-2) WHST.6-8.2<br>Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ETS1-3) RST.6-8.7 | Reason abstractly and quantitatively. (MS-ETS1-1),(MS-ETS1-3) MP.2<br>Model with mathematics. (MS-LS2-5) MP.4<br>Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1),(MS-ETS1-3) 7.EE.3<br>Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-LS2-5) 6.RP.A.3 |

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| Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ETS1-1) WHST.6-8.8<br>Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-2),(MS-LS2-4),(MS-ETS1-3), (MS-ETS1-2) WHST.6-8.9<br>Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ETS1-4) SL.8.5 | |
| **Core Instructional Materials** | • Lab stations and other teacher made materials<br>• Brain pop<br>• Ed puzzle<br>• Blooket<br>• Kahoot<br>• Quizizz<br>• Nearpod |
| **Career Readiness, Life Literacies and Key Skills** | 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).<br>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).<br>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). |
| **Computer Science and Design Thinking** | 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.<br>8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.<br>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 | | | | |
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| **English Language Learners** | **Special Education** | **At-Risk** | **Gifted and Talented** | **504** |
| Scaffolding<br>Word walls<br>Sentence/paragraph frames<br>Bilingual dictionaries/translation<br>Think alouds<br>Read alouds<br>Highlight key vocabulary<br>Annotation guides<br>Think-pair- share<br>Visual aides<br>Modeling<br>Cognates | Word walls<br>Visual aides<br>Graphic organizers<br>Multimedia<br>Leveled readers<br>Assistive technology<br>Notes/summaries<br>Extended time<br>Answer masking<br>Answer eliminator<br>Highlighter<br>Color contrast | Teacher tutoring<br>Peer tutoring<br>Study guides<br>Graphic organizers<br>Extended time<br>Parent communication<br>Modified assignments<br>Counseling | Curriculum compacting<br>Challenge assignments<br>Enrichment activities<br>Tiered activities<br>Independent research/inquiry<br>Collaborative teamwork<br>Higher level questioning<br>Critical/Analytical thinking tasks<br>Self-directed activities | Word walls<br>Visual aides<br>Graphic organizers<br>Multimedia<br>Leveled readers<br>Assistive technology<br>Notes/summaries<br>Extended time<br>Answer masking<br>Answer eliminator<br>Highlighter<br>Color contrast<br>Parent communication<br>Modified assignments<br>Counseling |

| LIFE SCIENCE | | |
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| **MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics** | | |
| **MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.** | | |
| **Clarification Statement:** Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems. | | |
| **Assessment Boundary:** N/A | | |
| Evidence Statements: MS-LS2-4 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Engaging in Argument from Evidence**<br>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 | **LS2.C: Ecosystem Dynamics, Functioning, and Resilience**<br>Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to | **Stability and Change**<br>Small changes in one part of a system might cause large changes in another part. |

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| either explanations or solutions about the natural and designed world(s).<br>Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.<br>**Connections to Nature of Science**<br>**Scientific Knowledge is Based on Empirical Evidence**<br>Science disciplines share common rules of obtaining and evaluating empirical evidence. | any physical or biological component of an ecosystem can lead to shifts in all its populations. | |

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

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

**NJSLS- ELA: RST.6-8.1, RI.8.8, WHST.6-8.1, WHST.6-8.9**

**NJSLS- Math: N/A**

**5E Model**

**MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.**

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| **Engage**<br>Anticipatory Set | Endangered Species Introductory Video- Here Today, Gone Tomorrow<br>http://mariana68.wix.com/biodiversityproject |
| **Exploration**<br>Student Inquiry | Endangered Species- A Multi Day Project<br>http://betterlesson.com/lesson/639346/endangered-species-a-multiday-project |
| **Explanation**<br>Concepts and Practices | In these lessons:<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas):<br>LS2.C: Ecosystem Dynamics, Functioning, and Resilience<br>Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. |

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| **Elaboration**<br>Extension Activity | Mini-Lessons<br>http://participatoryscience.org/standard/ms-ls2-4 |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Endangered Species- Recovery Plan Presentation<br>Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.<br>Students will work in teams to develop a plan to bring their chosen species back from the brink of extinction. Students will develop and share a brief presentation of their recovery plan. Recovery plans must address specific questions and are aimed at convincing listeners that their species deserves special attention.<br>Persuasive Plan Rubric<br>Infographic Rubric |

| **LIFE SCIENCE** | | |
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| **MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics** | | |
| **MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.** | | |
| **Clarification Statement:** Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations. | | |
| **Assessment Boundary:** N/A | | |
| Evidence Statements: MS-LS2-5 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Engaging in Argument from Evidence**<br>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). | **LS2.C: Ecosystem Dynamics, Functioning, and Resilience**<br>Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.<br>LS4.D: Biodiversity and Humans Changes in biodiversity can influence humans' resources, | **Stability and Change**<br>Small changes in one part of a system might cause large changes in another part.<br>**Connections to Engineering, Technology, and Applications of Science**<br>**Influence of Science, Engineering, and Technology on Society and the Natural World**<br>The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by |

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| Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. | such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary)<br>**ETS1.B: Developing Possible Solutions**<br>There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary) | 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.<br>**Connections to Nature of Science**<br>**Science Addresses Questions About the Natural and Material World**<br>Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. |

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

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

**NJSLS- ELA: RST.6-8.8, RI.8.8**

**NJSLS- Math: MP.4, 6.RP.A.3**

**5E Model**

**MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.**

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| **Engage**<br>Anticipatory Set | Why Is Biodiversity So Important?<br>https://www.youtube.com/watch?v=GK_vRtHJZu4 |
| **Exploration**<br>Student Inquiry | Saving the World- One Ecosystem at a Time<br>Elaborate: Each group takes their top-ranked idea from their chart and draws a "to scale" diagram depicting their idea.<br>http://www.nsta.org/docs/DoingGoodScienceChapter15.pdf |
| **Explanation**<br>Concepts and Practices | In these lessons:<br>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.<br>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.<br>Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas):<br>LS2.C: Ecosystem Dynamics, Functioning, and Resilience<br>Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. |

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| | LS4.D: Biodiversity and Humans Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary)<br>ETS1.B: Developing Possible Solutions<br>There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary) |
| **Elaboration**<br>Extension Activity | Disturbances in Ecosystems<br>http://wyobio.org/files/3814/2971/8811/MiddleSchool_Lesson8.pdf<br>http://wyobio.org/files/2914/1885/4938/MiddleSchool_Lesson8.2.pdf<br>After identifying ecosystem disturbances, work to determine possible solutions. Evaluate the solutions of other groups based on criteria. Write criteria as a class. |
| **Evaluation**<br>Assessment Tasks | Assessment Task A: Solutions Presentation<br>Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.<br>After researching their ecosystem, students will develop design solutions for maintaining the ecosystem's health and biodiversity. Students will record solutions on a chart and rank them, with "1" being the most important solution to maintain the ecosystem services. Groups will present their solutions and explain the reasoning behind their rankings. (MS-ETS1-1)<br><br>Assessment Task B: Solutions Diagram<br>Each group takes their top-ranked idea from their chart and draws a "to scale" diagram depicting their idea.<br><br>Assessment Task C: Designing a New Solution<br>After determining the top solution for each group, students will work as a class to determine similarities and differences among the different design solutions. The students will identify the best characteristics of each to combine into a new solution that could potentially be applicable to maintaining biodiversity in all ecosystems. (MS-ETS-1-3) |

| ENGINEERING DESIGN | | |
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| **MS-ETS1-1 Engineering Design** | | |
| **MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.** | | |
| Evidence Statements: MS-ETS1-1 | | |
| **Science & Engineering Practices** | **Disciplinary Core Ideas** | **Cross-Cutting Concepts** |
| **Asking Questions and Defining Problems**<br>Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.<br>Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. | **ETS1.A: Defining and Delimiting Engineering Problems**<br>The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. | **Influence of Science, Engineering, and Technology on Society and the Natural World**<br>All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. |
| **Connections to MS-ETS1.A: Defining and Delimiting Engineering Problems include: Physical Science: MS-PS3-3** | | |
| **Articulation of DCIs across grade-bands: 3-5.ETS1.A ; 3-5.ETS1.C ; HS.ETS1.A ; HS.ETS1.B** | | |
| **NJSLS- ELA: RST.6-8.1, WHST.6-8.8** | | |
| **NJSLS- Math: MP.2, 7.EE.3** | | |

| ENGINEERING DESIGN | | |
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| **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**<br>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.<br>Analyze and interpret data to determine similarities and differences in findings. | **ETS1.B: Developing Possible Solutions**<br>There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.<br>Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.<br>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** | | |
| **NJSLS- ELA: RST.6-8.1, RST.6-8.7, RST.6-8.9** | | |
| **NJSLS- Math: MP.2, 7.EE.3** | | |