Totowa Public Schools

Science

Grade 6

Aligned to NJSLS 2020 Standards

BOE Adopted: 08/31/2022

Revised 12/14/2022

Units of Study & Pacing Guide

Unit of Study	Timeline	Notes
Unit 1: Geology on Mars	6 Weeks	
Unit 2: Plate Motion	6 Weeks	
Unit 3: Rock Formation	6 Weeks	
Unit 4: Earth, Moon, Sun	4 Weeks	
Unit 5: Ocean Atmosphere and Climate	4 Weeks	Lessons in unit satisfy the Climate Change Law
Unit 6: Weather Patterns	4 Weeks	Lessons in unit satisfy the Climate Change Law
Unit 7: Earth's Changing Climate	2 Weeks	Lessons in unit satisfy the Climate Change Law
Unit 8: Plate Motion Engineering Internship	2 Weeks	
Unit 9: Earth's Changing Climate Engineering	2 Weeks	Lessons in the unit satisfy the Climate Change Law.
		Curricular Mandate List

Title	Geology on Mars
Unit Duration	6 Weeks
Unit Summary & Rationale	***Students will observe satellite images and Mars rover data as they consider what may have formed a long channel on the surface of Mars, the anchor phenomenon for the unit. Throughout the unit, students consider two possible claims for what may have formed the channel—flowing lava or flowing water. By comparing the channel on Mars to analogous structures on Earth's surface and in physical models, students are able to gather evidence and evaluate whether it supports the claim that flowing liquid water formed the channel. At the conclusion of the unit, students construct arguments for the claim they think is best supported by the evidence.***
Unit Goals	
Essential Questions	• How can we search for evidence that other planets were once habitable? • How does our understanding of Earth help us learn about other rocky planets? • How do models help scientists answer questions? • How do scientists construct arguments?
Enduring Understandings	• Earth, Mars, and other rocky planets can be thought of as systems. These systems are made up of interacting spheres that can include the geosphere, atmosphere, hydrosphere, and biosphere. • When landforms on different rocky planets look similar, it is evidence that they may have been formed by the same geologic process. • Scientists can use models to test their ideas and get evidence about processes in the natural world that are difficult to observe. • Landforms can provide evidence about the past because they remain after the geologic processes that formed them stop happening.

	• Models represent the natural processes being investigated in important ways, but they are not exactly the same.
Learning Outcomes	• Earth, Mars, and other rocky planets can be thought of as systems. These systems are made up of interacting spheres that can include the geosphere, atmosphere, hydrosphere, and biosphere. • When landforms on different rocky planets look similar, it is evidence that they may have been formed by the same geologic process. • Scientists can use models to test their ideas and get evidence about processes in the natural world that are difficult to observe. • Landforms can provide evidence about the past because they remain after the geologic processes that formed them stop happening. • Models represent the natural processes being investigated in important ways, but they are not exactly the same. • Career Exploration - Examine/learn about the career of a geologist.

Assessment Evidence	
Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Warm Ups, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research
Summative	In correlation with the NJSLS, students must demonstrate the following as summative assessments: • 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. Other summative assessments will include but are not limited to: projects, summative tests, lab skills demonstrations, vocabulary quizzes, and designs for Science Fair projects.
Alternative and Benchmark	Alternative - Read to the student and chart oral responses. Word banks, sentence frames, oral responses, graphic organizers, observations, portfolios of student work, orally administered assessments, and anecdotal notes. Benchmark – LinkIt Benchmark Assessment, Teacher Generated Assessments

	Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Amplify Digital Curriculum, Generation Genius, BrainPop, Mystery Science, Microsoft 365, Primary and Secondary Source Documents, Lab Materials as needed, Approved Class Resource List, Amplify Readings, Labs, Simulations
Content & Interdisciplinary Standards	
NJ 2020 SLS: Science	
Standards	
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.]	
Science and Engineering Practices	
Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. • Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)	
Crosscutting Concepts	
Interdependence of Science, Engineering, and Technology	• Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (MS-ESS1-3)
NJ: 2016 SLS: English Language Arts & Companion Standards	
• R.1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.	

- R.7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
- RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts.
- RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.
- RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading
- RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
- NJSLSA.W.1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- NJSLSA.W.2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- WHST.6-8.1: Write arguments focused on discipline-specific content.
- ○ 1.a: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- ○ 1b: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- ○ 1.c: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
- ○ 1.d: Establish and maintain a formal style.
- WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- ○ 2.b: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. ○ 2.d: Use precise language and domain-specific vocabulary to inform about or explain the topic. ●

- WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST.6-8.5: With some guidance and support from peers and adults, develop and strengthen by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
- WHST.6-8.7: Conduct short research projects to answer a question (including a self generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research.
- WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences

NJ: 2016 SLS: Mathematics

- 6.RP.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- 6.RP.3: Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
- 6.RP.3d: Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
- 6.NS.3: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- MP.2 Reason abstractly and quantitatively. (MS-ESS1-3)
- MP.4 Model with mathematics.

2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

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

2020 SLS: Career Readiness, Life Literacies, and Key Skills

NJSLS Performance Expectations (By the end of 8th Grade)

- 9.4.8.TL.4 Synthesize and publish information about a local or global issue or event.
- 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Interdisciplinary/21st Century Connections

21st Century Connections	• Creativity and Innovation • Information and Media Literacy • Critical Thinking and Problem Solving • Technology Literacy
Math	• See Above
SEL	• Responsible Decision-Making • Self-Management • Relationship Skills New Jersey Social and Emotional Learning Competencies and Sub Competencies.docx

Title	Plate Motion
Unit Duration	6 Weeks
Unit Summary & Rationale	***Students will investigate a fossil mystery: why are fossils of Mesosaurus, a population of extinct reptiles that once lived all together, now found separated by thousands of kilometers of ocean? After determining that there is a plate boundary between these groups of fossils, students determine whether the fossils were separated suddenly as a result of one geologic event, or slowly over millions of years. Students explore plates and plate boundaries through a series of hands-on investigations and engaging articles and videos featuring real-life scientists. Using the Plate Motion Simulation, students create continents, set plates in motion, and watch what happens. By the end of the unit, students are able to explain that plates are destroyed and rock is added to plates constantly and slowly (and these processes have been occurring for millions of years) due to large-scale plate movement.***
Unit Goals	
Essential Questions	• What is the land like underneath Earth's surface? • How do Earth's plates move? • What happens to the plates and the mantle at plate boundaries? • What do we know about plate motion that is currently taking place? • What evidence do we have of past plate motion?

Enduring Understandings	• Earth's outer layer is made of hard, solid rock. • Earth's outer layer is divided into sections called plates. • Geologists look for patterns in landforms and in geologic events in order to better understand Earth. • The plates of Earth's outer layer move. • Earth's plates move on top of a soft, solid layer of rock called the mantle. • At divergent plate boundaries, rock rises from the mantle and hardens, adding new solid rock to the edges of both plates. • At convergent plate boundaries, one plate moves underneath the other plate and sinks into the mantle.
Learning Outcomes	• Earth, Mars, and other rocky planets can be thought of as systems. These systems are made up of interacting spheres that can include the geosphere, atmosphere, hydrosphere, and biosphere. • When landforms on different rocky planets look similar, it is evidence that they may have been formed by the same geologic process. • Scientists can use models to test their ideas and get evidence about processes in the natural world that are difficult to observe. • Landforms can provide evidence about the past because they remain after the geologic processes that formed them stop happening. • Models represent the natural processes being investigated in important ways, but they are not exactly the same.

Assessment Evidence	
Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Warm Ups, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research
Summative	In correlation with the NJSLS, students must demonstrate the following as summative assessments: MS-ESS1-3 - Analyze and interpret data to determine scale properties of objects in the solar system. MS-ESS2-2 - Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

	Other summative assessments will include but are not limited to: projects, summative tests, lab skills
Alternative and Benchmark	Alternative - Read to the student and chart oral responses. Word banks, sentence frames, oral responses, graphic organizers, observations, portfolios of student work, orally administered assessments, and anecdotal notes. Benchmark – LinkIt Benchmark Assessment, Teacher Generated Assessments Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Amplify Digital Curriculum, Generation Genius, BrainPop, Mystery Science, Microsoft 365, Primary and Secondary Source Documents, Lab Materials as needed, Approved Class Resource List, Amplify Readings, Labs, Simulations
Content & Interdisciplinary Standards	
NJ 2020 SLS: Science	
Standards	
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, spacebased 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.] MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]	

<table>
<tr><td colspan="2">Science and Engineering Practices</td></tr>
<tr><td colspan="2">Analyzing and Interpreting Data - Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. (MS-ESS2-2)</td></tr>
<tr><td colspan="2">Disciplinary Core Ideas (DCI)</td></tr>
<tr><td colspan="2">ESS1.B: Earth and the Solar System: 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 and its gravitational pull on them. (MS-ESS1-3)
ESS2.A: Earth's Materials and Systems: The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2)
ESS2.C: The Roles of Water in Earth's Surface Processes: Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2)</td></tr>
<tr><td colspan="2">Crosscutting Concepts</td></tr>
<tr><td>Scale, Proportion, and Quantity</td><td>Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3), (MSESS1-4)
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NJ: 2016 SLS: English Language Arts & Companion Standards
• NJSLA.W.1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. • NJSLA. W.2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. • RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. • RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently. • RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. • RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. • RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. • RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. • RST.6-8.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. • RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). • RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. • RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. • RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3), (MS-LS1-4) • WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. • WHST.6-8.1: Write arguments focused on discipline-specific content. • WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. • WHST.6-8.1b: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

- WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic.
- WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research.
- NJLA.SL.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- NJSLA.SL.2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- NJSLA.SL.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
- NJSLA. SL.4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- NJSLA.SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2, (MS-LS1-7)
- NJSA SL.6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate. clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized references materials, as appropriate.
- NJSLA.L.6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

NJ: 2016 SLS: Mathematics

- 6.NS.3: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- 6.NS.7.d: Distinguish comparisons of absolute value from statements about order.
- 6.NS.7b: Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- 6.RP.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

- 6.RP.A.1 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.3.d: Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
- 6.RP.3c: Find a percent of a quantity as a rate per 100; solve problems involving finding the whole given a part and the percent.
- 6.SP.5: Summarize numerical data sets in relation to their context.
- 6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4), (MS-LS1-5)
- 6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4), (MS-LS1-5)
- 6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-2), (MS-ESS1-4)
- 6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1), (MS-LS1-2), (MS-LS1-3), (MS-LS1-6)
- 7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-ESS1-1), (MS-ESS1-2), (MS-ESS1-3)
- 7.NS.2: Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
- 7.NS.3: Solve real-world and mathematical problems involving the four operations with rational numbers.
- 7.SP.1: Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
- 7.EE.B.6 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS1-2), (MS-ESS1-4)
- MP.2 Reason abstractly and quantitatively. (MS-ESS1-3)
- MP.4 Model with mathematics. (MS-LS3-2)

2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

• 8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies. • 8.2.8.EC.2: Examine the effects of ethical and unethical practices in product design and development.
2020 SLS: Career Readiness, Life Literacies, and Key Skills
NJSLS Performance Expectations (By the end of 8th Grade)
• 9.4.8.TL.4 Synthesize and publish information about a local or global issue or event. • 9.4.8.IML.1 Ask insightful questions to organize different types of data and create meaningful visualizations. • 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.
Interdisciplinary/21st Century Connections

21st Century Connections	• Creativity and Innovation • Information and Media Literacy • Critical Thinking and Problem Solving • Technology Literacy
Math	• See Above
SEL	• Self-Awareness • Responsible Decision-Making • Self-Management • Relationship Skills • Social Awareness New Jersey Social and Emotional Learning Competencies and Sub Competencies.docx

Title	Rock Transformation
Unit Duration	6 Weeks
Unit Summary & Rationale	***Geologists examine rock formations to learn about the history of the rock. In this unit, students play the role of student geologists as they investigate different ways rocks form and change. Using physical models, a digital simulation, and hands-on activities as well as information gathered from data and science texts, students investigate the cycling of matter (rock material) on Earth and how energy from the sun and from Earth's interior drive different rock transformation processes.***

Unit Goals	
Essential Questions	• How do rocks form? • What causes sediment and magma to form? • How do rock formations move between the surface and Earth's interior? • How do uplift and subduction lead to the transformation of rocks?
Enduring Understandings	• Rocks can form in different ways. This causes them to be different types. • When sediment is compacted and cemented together, it forms sedimentary rock. • When magma cools, it hardens to form igneous rock. • Matter gets transformed by energy, but the same matter is still present. • Sediment forms when any type of rock is weathered, a process driven by energy from the sun. • Magma forms when any type of rock is melted, a process driven by energy from Earth's interior. • Uplift and subduction can expose rock formations to different energy sources, which can transform them. • Any type of rock can transform into any type of rock because of plate motion.
Learning Outcomes	• Develop a modeling using hard candy to show how rocks form from sediment. • Examine evidence about the rocks of the Great Plains and Rocky Mountains to determine whether they formed from sediment or magma. • Write about how energy affects rocks using unit vocabulary. • Consider and discuss claims about the formation of the Great Plains and Rocky Mountains. • Model how rock transformation processes affect rock materials in a classroom model. • Discuss and write about how plate motion exposes rock formation to energy sources. • Use evidence to explain how the Great Plains and Rocky Mountains could have transformed. • Model how the Rocky Mountains transformed into the Great Plains using the paper Modeling Tool. • Support a claim about why the Great Plains and Rocky Mountains have similar mineral compositions.

Assessment Evidence	
Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Warm Ups, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research

Summative	In correlation with the NJSLS, students must demonstrate the following as summative assessments: 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 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-ESS2-4 , 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. Other summative assessments will include but are not limited to: projects, summative tests, lab skills demonstrations, vocabulary quizzes, and designs for Science Fair projects. 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-ESS3-3 , Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

	MS-ESS3- 4 , Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. Other summative assessments will include but are not limited to: lesson activities, summative tests, lab skills, demonstrations, and vocabulary quizzes.
Benchmark and Alternative	Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Amplify Digital Curriculum, Generation Genius, BrainPop, Mystery Science, Microsoft 365, Primary and Secondary Source Documents, Lab Materials as needed, Approved Class Resource List, Amplify Readings, Labs, Simulations
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NJ 2020 SLS: Science	
Standards	
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.] MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.] MS-ESS2-2: Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts)	

usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]

MS-ESS2-3 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.

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

MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses result 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.]

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

MS-ESS3-1: Construct a scientific explanation based on evidence for how the uneven distributions of Earth’s mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically nonrenewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to

petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]

MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes

Science and Engineering Practices

Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)

Developing and Using Models - Modeling in in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena. (MS-ESS2-1), (MS-ESS2-6)
- Develop a model to describe unobservable mechanisms. (MS-ESS2-4)

Constructing Explanations and Designing Solutions - Constructing explanations and designing solutions in in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. (MS-ESS2-2)

Constructing Explanations and Designing Solutions - Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Planning and Carrying Out Investigations - Planning and carrying out investigations in 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.\

- 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. (MS-ESS2-5)

Constructing Explanations and Designing Solutions - Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)

Engaging in Argument from Evidence - Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-ESS3-4)

Disciplinary Core Ideas (DCI)

ESS1.A: The Universe and Its Stars

- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)
- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)

- This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1)
- The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)

ESS2.A: Earth's Materials and Systems

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

ESS1.B: Earth and the Solar System

- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2), (MS-ESS1-3)

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

- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4)
- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5)
- Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4)
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6)
- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2)

ESS2.D: Weather and Climate

- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)
- Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5

• The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6) ESS3.A: Natural Resources • Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.	
Crosscutting Concepts	
Scale, Proportion, Quantity	• Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3), (MS-ESS1-4) • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS2-2)
Energy and Matter	• Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)
Cause and Effect	• Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5) • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1) • Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3) • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-4)
Stability and Change	• Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)
Interdependence of Science, Engineering, and Technology	• Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (MS-ESS1-3)
Systems and Models	• Models can be used to represent systems and their interactions. (MS-ESS1-2)

	• Models can be used to represent systems and their interactions— such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)
Scientific Knowledge Assumes an Order and Consistency in Natural Systems	• Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1-1), (MS-ESS1-2)
Influence of Science, Engineering, and Technology on Society and the Natural World	• All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-4) • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-2),(MS-ESS3-3)
Science Addresses Questions About the Natural and Material World	• Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-ESS3-4)
NJ: 2016 SLS: English Language Arts & Companion Standards	
• NJSLA.W.1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. • NJSLA. W.2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. • RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. • RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.	

- RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.
- RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
- RST.6-8.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
- RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
- RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
- RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3), (MS-LS1-4)
- WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- WHST.6-8.1: Write arguments focused on discipline-specific content.
- WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- WHST.6-8.1b: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic.
- WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

- WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research.
- NJLA.SL.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- NJSLA.SL.2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- NJSLA.SL.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
- NJSLA. SL.4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- NJSLA.SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2, (MS-LS1-7)
- NJSA SL.6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate. clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized references materials, as appropriate.
- NJSLA.L.6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

NJ: 2016 SLS: Mathematics

- 6.NS.3: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- 6.NS.7.d: Distinguish comparisons of absolute value from statements about order.
- 6.NS.7b: Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- 6.RP.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- 6.RP.A.1 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.3.d: Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
- 6.RP.3c: Find a percent of a quantity as a rate per 100; solve problems involving finding the whole given a part and the percent.
- 6.SP.5: Summarize numerical data sets in relation to their context.

- 6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4), (MS-LS1-5)
- 6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4), (MS-LS1-5)
- 6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-2), (MS-ESS1-4)
- 6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1), (MS-LS1-2), (MS-LS1-3), (MS-LS1-6)
- MP.2 Reason abstractly and quantitatively. (MS-ESS1-3)
- MP.4 Model with mathematics. (MS-LS3-2)

2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

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

2020 SLS: Career Readiness, Life Literacies, and Key Skills

NJSLS Performance Expectations (By the end of 8th Grade)

- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.
- 9.4.8.TL.4 Synthesize and publish information about a local or global issue or event.
- 9.4.8.IML.1 Ask insightful questions to organize different types of data and create meaningful visualizations.
- 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8)
- 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).

Interdisciplinary/21st Century Connections

21st Century Connections	• Creativity and Innovation • Information and Media Literacy • Critical Thinking and Problem Solving • Technology Literacy

SEL	• Demonstrate an awareness of the expectations for social interactions in a variety of settings. • Develop, implement, and model effective problem-solving and critical thinking skills. • Establish and maintain healthy relationships. • Utilize positive communication and social skills to interact effectively with others.
Math	• See Above

Title	Earth, Moon, and the Sun
Unit Duration	4 Weeks
Unit Summary & Rationale	***The Earth, Moon, and Sun unit begins as students take on the role of student astronomers, tasked with advising an astrophotographer who needs to take photographs of the Moon for a fictional magazine called About Space. The astrophotographer can only take pictures of specific features on the Moon at certain times. In order to provide advice about when to take photographs of the Moon as well as how to take photographs of a lunar eclipse, students will need to investigate where the Moon's light comes from, what causes the characteristic changes in the appearance of the Moon that we observe, and what conditions are required to view phenomena, such as particular moon phases and lunar eclipses.***
Unit Goals	
Essential Questions	• What is an astrophotographer? • Where does the Moon get it's light? • Why is part of the Moon dark? • How can we predict how the Moon will change appearances from day to day? • If half of the Moon is always illuminated, why does its appearance from Earth change? • What makes the Moon completely dark during a lunar eclipse? • Why isn't there a lunar eclipse every time Earth is in between the sun and the Moon?
Enduring Understandings	• The Moon does not make its own light; the sun illuminates the Moon. • When a model is "to scale," object sizes and distances are larger or smaller than in the real world but the same relative to one another. Some models need to be "not to scale" to be useful.

	• The sun illuminates the half of the Moon that is facing it, and the other half is dark. Light from the sun travels in straight lines. • From Earth we can only see the half of the Moon that is facing us. Because the Moon moves to different positions around Earth, we see different amounts of the illuminated half of the Moon. This is why we see different phases of the Moon. • There is a pattern to the position of the Moon because the Moon orbits around Earth. It takes about one month for the Moon to orbit Earth, so it takes about one month to see the full pattern of moon phases. This pattern repeats with every orbit of the Moon. • During a lunar eclipse, the Moon is completely dark because Earth blocks sunlight from hitting the Moon. Lunar eclipses can only happen when Earth is in between the sun and the Moon. Lunar eclipses do not happen every time Earth is in between the sun and the Moon. • The Moon is only completely dark when the sun, Earth, and the Moon are in a straight line, with Earth in the middle.
Learning Outcomes	• Use a simple physical model with foam balls to explore how the view of the Moon from Earth changes as the Moon orbits. • Understand how scale must always be considered when considering large objects and distances. 3. Translate their ideas from models that are mostly not to scale in order to describe their understanding of the full scale of the Earth, Moon, and sun system. • Represent their ideas about scale by creating visual models in the Earth, Moon, and Sun Modeling Tool. • Use the Sim to investigate where the moon gets its light. • Use a moon sphere model to observe light and dark on the Moon. • Gather evidence in the Sim to explain why part of the moon is dark. • Use the Modeling Tool to show light and dark on the Moon. • Use the Moon sphere model to gather evidence about why the Moon's appearance from Earth changes. • Predict and observe the Moon at different positions using the Sim

Assessment Evidence	
Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Warm Ups, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research

Summative	In correlation with the NJSLS, students must demonstrate the following as summative assessments: • 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, 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. Other summative assessments will include but are not limited to: lesson activities, summative tests, lab skills, demonstrations, and vocabulary quizzes.
Alternative and Benchmark	Alternative - Read to the student and chart oral responses. Word banks, sentence frames, oral responses, graphic organizers, observations, portfolios of student work, orally administered assessments, and anecdotal notes. Benchmark – LinkIt Benchmark Assessment, Teacher Generated Assessments Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Amplify Digital Curriculum, Generation Genius, BrainPop, Mystery Science, Microsoft 365, Primary and Secondary Source Documents, Lab Materials as needed, Approved Class Resource List, Amplify Readings, Labs, Simulations
Content & Interdisciplinary Standards	
NJ 2020 SLS: Science	
Standards	
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.]	

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.]

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.]

Science and Engineering Practices

Developing and Using Models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
Develop and use a model to describe phenomena. (MS-ESS1-1),(MS-ESS1-2)
Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)

Disciplinary Core Ideas (DCI)

ESS1.A: The Universe and Its Stars

- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)
- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)

ESS1.B: Earth and the Solar System

• The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MS-ESS1-3) • This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1) • The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)	
Crosscutting Concepts	
Patterns	• Patterns can be used to identify cause-and-effect relationships. (MS-ESS1-1)
Scale, Proportion, and Quantity	• Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3)
Systems and System Models	• Models can be used to represent systems and their interactions. (MS-ESS1-2)
Interdependence of Science, Engineering, and Technology	• Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (MS-ESS1-3)
Scientific Knowledge Assumes an Order and Consistency in Natural Systems	• Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1-1),(MS-ESS1-2)

NJ: 2016 SLS: English Language Arts & Companion Standards
• NJSLA.W.1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. • NJSLA. W.2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. • RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. • RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently. • RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. • RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. • RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. • RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. • RST.6-8.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. • RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). • RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. • RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. • RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3), (MS-LS1-4) • WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. • WHST.6-8.1: Write arguments focused on discipline-specific content. • WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. • WHST.6-8.1b: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

- WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic.
- WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research.
- NJLA.SL.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- NJSLA.SL.2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- NJSLA.SL.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
- NJSLA. SL.4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- NJSLA.SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2, (MS-LS1-7)
- NJSA SL.6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate. clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized references materials, as appropriate.
- NJSLA.L.6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

NJ: 2016 SLS: Mathematics

- 6.NS.3: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- 6.NS.7.d: Distinguish comparisons of absolute value from statements about order.
- 6.NS.7b: Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- 6.RP.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

- 6.RP.A.1 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.3.d: Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
- 6.RP.3c: Find a percent of a quantity as a rate per 100; solve problems involving finding the whole given a part and the percent.
- 6.SP.5: Summarize numerical data sets in relation to their context.
- 6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4), (MS-LS1-5)
- 6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4), (MS-LS1-5)
- 6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-2), (MS-ESS1-4)
- 6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1), (MS-LS1-2), (MS-LS1-3), (MS-LS1-6)
- MP.2 Reason abstractly and quantitatively. (MS-ESS1-3)
- MP.4 Model with mathematics. (MS-LS3-2)

2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

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

2020 SLS: Career Readiness, Life Literacies, and Key Skills

NJSLS Performance Expectations (By the end of 8th Grade)

- 9.4.8.TL.4 Synthesize and publish information about a local or global issue or event.
- 9.4.8.IML.1 Ask insightful questions to organize different types of data and create meaningful visualizations.
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.
- 9.2.8.CAP.10: Evaluate how careers have evolved regionally, nationally, and globally.

• 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).	
Interdisciplinary/21st Century Connections	
21st Century Connections	• Creativity and Innovation • Information and Media Literacy • Critical Thinking and Problem Solving • Technology Literacy
Math	• See Above
SEL	• Self-Awareness • Responsible Decision-Making • Self-Management New Jersey Social and Emotional Learning Competencies and Sub Competencies.docx

Title	Ocean Atmosphere and Climate
Unit Duration	4 Weeks
Unit Summary & Rationale	***In the Ocean, Atmosphere, and Climate unit, students investigate how ocean currents behave and what effect they have on the climate of different locations around the world, specifically the air temperature of various locations. Energy flow from the sun is what drives this progression.***
Unit Goals	
Essential Questions	• What is a climatologist? • How does air get energy? • Why do different locations have different air temperatures? • What factors might affect ocean surface temperatures? • How do ocean currents affect the air temperatures of the locations they pass? • What determines how the ocean currents move? • How can changes to prevailing winds affect the air temperature of a location?

Enduring Understandings	• The amount of energy transferred from the sun to the surface of a location depends on the location's latitude. • Ocean currents can affect the air temperature of a location by affecting the amount of energy in the surface of the location. • The direction of prevailing winds and the position of the continents determine the path of ocean currents.
Learning Outcomes	• Students will identify and describe each of Earth's systems and the cycles that occur within them. • Students will develop and use models to investigate how Earth's systems interact. • Observe and describe the distribution of water on Earth, and explore the effect of the oceans on landforms, climates, and ecosystems. • Investigate and observe causes and effects as they run experiments with the Ocean, Atmosphere, and Climate Simulation and in two physical models. • Test the effects (particularly on air temperature) of changing the amount of energy transferred from the sun, presence or absence of a surface, changes to ocean currents and prevailing winds. • Reflect on several causes of regional air temperature differences. • Write explanations detailing the causes of cooling in Christchurch, New Zealand, during El Niño years. • Write an argument about the causes and effects on regional air temperature in the past (millions of years ago) and present-day locations of a landmass called South China. • Represent their ideas about cause and effect by creating visual models in the Ocean, Atmosphere, and Climate Modeling Tool (***Climate Change)***

Assessment Evidence	
Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Warm Ups, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research
Summative	In correlation with the NJSLS, students must demonstrate the following as summative assessments: • 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.

	• 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 result 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. Other summative assessments will include but are not limited to: lesson activities, summative tests, lab skills, demonstrations, and vocabulary quizzes.
Alternative and Benchmark	Alternative - Read to the student and chart oral responses. Word banks, sentence frames, oral responses, graphic organizers, observations, portfolios of student work, orally administered assessments, and anecdotal notes. Benchmark – LinkIt Benchmark Assessment, Teacher Generated Assessments Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Amplify Digital Curriculum, Generation Genius, BrainPop, Mystery Science, Microsoft 365, Primary and Secondary Source Documents, Lab Materials as needed,Approved Class Resource List, Amplify Readings, Labs, Simulations
Content & Interdisciplinary Standards	
NJ 2020 SLS: Science	
Standards	
MS-ESS2-2., Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering	

and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]

MS-ESS2-3., 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.]

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

MS-ESS2-5., Collect data to provide evidence for how the motions and complex interactions of air masses result 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.]

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.]

Science and Engineering Practices

Analyzing and Interpreting Data - Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3)

Constructing Explanations and Designing Solutions - Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. (MS-ESS1-4),(MS-ESS2-2)

Connections to Nature of Science - Scientific Knowledge is Open to Revision in Light of New Evidence

- Science findings are frequently revised and/or reinterpreted based on new evidence. (MS-ESS2-3)

Developing and Using Models - Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop a model to describe unobservable mechanisms. (MS-ESS2-4)
- Develop and use a model to describe phenomena. (MS-ESS2-6)

Planning and Carrying Out Investigations - Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

- 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. (MS-ESS2-5)

Constructing Explanations and Designing Solutions - Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-ESS3-1)

Disciplinary Core Ideas (DCI)

ESS1.C: The History of Planet Earth

- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE),(secondary to MS-ESS2-3)

ESS2.A: Earth's Materials and Systems

- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2)

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

- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)

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

- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2)
- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5)
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6)

ESS2.D: Weather and Climate

- These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)
- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)
- Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5)
- The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)

Crosscutting Concepts	
Patterns	• Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3)

Scale Proportion and Quantity	• Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-4),(MS-ESS2-2)
Cause and Effect	• Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)
Systems and Models	• Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)

NJ: 2016 SLS: English Language Arts & Companion Standards

- NJSLA.W.1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- NJSLA. W.2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts.
- RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.
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- RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
- WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
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- WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic.
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- NJSLA.SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
- NJSA SL.6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate. clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized references materials, as appropriate.

- NJSLA.L.6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

NJ: 2016 SLS: Mathematics

- 6.NS.3: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- 6.NS.C.5, Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-ESS2-5)
- 6.NS.7.d: Distinguish comparisons of absolute value from statements about order.
- 6.NS.7b: Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- 6.RP.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- 6.RP.A.1 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.3.d: Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
- 6.RP.3c: Find a percent of a quantity as a rate per 100; solve problems involving finding the whole given a part and the percent.
- 6.SP.5: Summarize numerical data sets in relation to their context.
- 6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4), (MS-LS1-5)
- 6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4), (MS-LS1-5)
- 6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-2), (MS-ESS1-4)
- 6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1), (MS-LS1-2), (MS-LS1-3), (MS-LS1-6)
- MP.2 Reason abstractly and quantitatively. (MS-ESS1-3)
- MP.4 Model with mathematics. (MS-LS3-2)

2020 SLS: Computer Science & Design Thinking	
NJSLS Performance Expectations (By the end of 8th Grade)	
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2020 SLS: Career Readiness, Life Literacies, and Key Skills	
NJSLS Performance Expectations (By the end of 8th Grade)	
• 9.4.8.TL.4 Synthesize and publish information about a local or global issue or event. • 9.4.8.IML.1 Ask insightful questions to organize different types of data and create meaningful visualizations. • 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.	
Interdisciplinary/21st Century Connections	
21st Century Connections	• Critical thinking • Collaboration and Teamwork • Problem Solving • Creativity and Innovation
Social Studies	• 6.3.8.CivicsPR.4: Use evidence and quantitative data to propose or defend a public policy related to climate change.
Math	• See Above
SEL	• Self-Awareness • Responsible Decision-Making • Self-Management • Relationship Skills • Social Awareness New Jersey Social and Emotional Learning Competencies and Sub Competencies.docx

Title	Weather Patterns
Unit Duration	4 Weeks

Unit Summary & Rationale	***In this unit students will investigate how water vapor, temperature, energy transfer, and wind influence local weather patterns and how these factors can lead to severe rainstorms. Using physical models, a digital simulation, and hands-on activities as well as information gathered from data and science texts, students will investigate the mechanisms by which a warm weather rainstorm can be generated, through the lens of energy transfer.***
Unit Goals	
Essential Questions	• What is a meteorologists? • What makes rain happen? • What causes an air parcel to cool? • What determines how much an air parcel will cool? • How can wind affect the cooling of an air parcel?
Enduring Understandings	• Rain can happen when an air parcel cools and loses energy. • The loss of energy causes water vapor in the air parcel to condense and fall as rain. • A warmer air parcel has more energy, so it can rise higher into the troposphere and lose more energy, which can result in a greater amount of rain. • Wind can push an air parcel higher into the troposphere causing the air parcel to lose more energy, which can result in a greater amount of rain.
Learning Outcomes	• Use the Weather Patterns Simulation and see the air parcel temperature change as the parcel continues to rise until it reaches stability with the surrounding air. • Use the Sim to investigate how liquid water becomes water vapor. • Use the Sim to observe what happens when water vapor cools. • Use plastic bags to create models of air parcels to observe the process of condensation. • Discuss the factors that influence the severity of a rainstorm. • Read an informational text about cloud formation that describes how an air parcel loses energy until it becomes stable with the surrounding temperature. • Write to explain how air parcels change temperature as they rise until the temperature becomes stable with the surrounding temperature. • Use the Sim to investigate the connections between energy transfer and the size of a rainstorm. • Use the Sim to observe how the initial temperature of an air parcel affects its final height. • Use the Sim to investigate how the temperature of air can affect the amount of rain.

- Explain how the Earth is impacted because of changes in weather patterns (***Climate Change***)

Assessment Evidence	
Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Warm Ups, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research
Summative	In correlation with the NJSLS, students must demonstrate the following as summative assessments: • MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. • MS-ESS2-4 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 result 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. • 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. Other summative assessments will include but are not limited to: lesson activities, summative tests, lab skills, demonstrations, and vocabulary quizzes.
Alternative and Benchmark	Alternative - Read to the student and chart oral responses. Word banks, sentence frames, oral responses, graphic organizers, observations, portfolios of student work, orally administered assessments, and anecdotal notes. Benchmark – LinkIt Benchmark Assessment, Teacher Generated Assessments Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Amplify Digital Curriculum, Generation Genius, BrainPop, Mystery Science, Microsoft 365,

	Primary and Secondary Source Documents, Lab Materials as needed, Approved Class Resource List, Amplify Readings, Labs, Simulations

Content & Interdisciplinary Standards

NJ 2020 SLS: Science

Standards

MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]

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

MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses result 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.] •

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.]

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 with no 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).]

Science and Engineering Practices

Developing and Using Models - Modeling in in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena. (MS-ESS2-1), (MS-ESS2-6)
- Develop a model to describe unobservable mechanisms. (MS-ESS2-4)

Planning and Carrying Out Investigations - Planning and carrying out investigations in 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.

- 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. (MS-ESS2-5)

Analyzing and Interpreting Data - Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to determine similarities and differences in findings. (MS-ESS3-2)

Disciplinary Core Ideas (DCI)

ESS2.A: Earth's Materials and Systems

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

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

- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4)
- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5)
- Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4)
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6)

ESS3.B: Natural Hazards

- 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. (MS-ESS3-2)

ESS2.D: Weather and Climate

- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)
- Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5)
- The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)

Crosscutting Concepts	
Stability and Change	• Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)
Energy and Matter	• Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)
Cause and Effect	• Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)

Systems and Models	• Models can be used to represent systems and their interactions— such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)
Patterns	• Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2)
Influence of Science, Engineering, and Technology on Society and the Natural World	• The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-2),(MS-ESS3-3)

NJ: 2016 SLS: English Language Arts & Companion Standards

- NJSLA.W.1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- NJSLA. W.2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts.
- RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.
- RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.
- RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
- RST.6-8.6: Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
- RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

- RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
- RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3), (MS-LS1-4)
- WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- WHST.6-8.1: Write arguments focused on discipline-specific content.
- WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- WHST.6-8.1b: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic.
- WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research.
- NJLA.SL.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- NJSLA.SL.2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- NJSLA.SL.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
- NJSLA. SL.4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- NJSLA.SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2, (MS-LS1-7)

- NJSA SL.6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate. clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized references materials, as appropriate.
- NJSLA.L.6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

NJ: 2016 SLS: Mathematics

- 6.NS.3: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- 6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-ESS2-5)
- 6.NS.7.d: Distinguish comparisons of absolute value from statements about order.
- 6.NS.7b: Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- 6.RP.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- 6.RP.A.1 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.3.d: Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
- 6.RP.3c: Find a percent of a quantity as a rate per 100; solve problems involving finding the whole given a part and the percent.
- 6.SP.5: Summarize numerical data sets in relation to their context.
- 6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4), (MS-LS1-5)
- 6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4), (MS-LS1-5)
- 6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-2), (MS-ESS1-4)
- 6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of

as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1), (MS-LS1-2), (MS-LS1-3), (MS-LS1-6)

- MP.2 Reason abstractly and quantitatively. (MS-ESS1-3)
- MP.4 Model with mathematics. (MS-LS3-2)

2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

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

2020 SLS: Career Readiness, Life Literacies, and Key Skills

NJSLS Performance Expectations (By the end of 8th Grade)

- 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas.
- 9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect.
- 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Interdisciplinary/21st Century Connections

21st Century Connections	• Critical thinking • Collaboration and Teamwork • Problem Solving
Math	• See Above
SEL	• Self-Awareness • Responsible Decision-Making • Self-Management • Relationship Skills • Social Awareness New Jersey Social and Emotional Learning Competencies and Sub Competencies.docx

Title	Earth's Changing Climate

Unit Duration	6 Weeks
Unit Summary & Rationale	***In order to delve into the mechanism of climate change, students investigate with a computer simulation, data, physical models, and science texts. They refute claims based on common misconceptions—an increase in solar energy or direct heating from human activities cause global warming. Students learn how energy from the sun interacts with Earth's atmosphere and surface. The unit concludes with a Science Seminar where students analyze evidence and debate whether large volcanic eruptions cool or warm Earth.***
Unit Goals	
Essential Questions	• What could be causing ice to melt and temperatures to increase on Earth? • What kinds of changes to the atmosphere could affect how much energy is absorbed by Earth's surface? • How can the amount of energy absorbed by Earth's surface change? • How do carbon dioxide and methane affect energy entering or exiting the Earth system? • Why does an increase in carbon dioxide or methane result in more energy entering and exiting the Earth system? • Why are carbon dioxide and methane increasing in the atmosphere?
Enduring Understandings	• Changes in the amount of carbon dioxide and methane in the atmosphere are correlated with changes in the amount of energy absorbed by Earth's surface. • Carbon dioxide and methane affect the balance of energy entering and exiting the Earth system. • Carbon dioxide and methane redirect outbound energy, which causes less energy to exit.
Learning Outcomes	• Engage the class in reflecting on stability and change in Earth's climate. • Read about past climate changes and what factors led a system with a stable climate to change. • Write explanations of the present climate change. (***Climate Change)*** • Represent their ideas about stability and change in Earth's climate by creating visual models in the Earth's Changing Climate Modeling Tool. • Analyze data showing ice decrease and temperature increase over time. • Use the Sim to model ice melting and observe energy. • Generate claims about why the ice on Earth's surface is melting. • Use the Sim to test how increasing or decreasing gases in the atmosphere affects temperature, energy, and ice.

- Use unit vocabulary to explain the changes that could affect how much energy is absorbed by Earth's surface.
- Use a token model to track energy entering and exiting a system.
- Use the Sim to test the amount of energy that enters and exits the Earth system in various scenarios.
- Use the Sim to investigate how gases redirect outgoing energy back toward Earth's surface. (***Climate Change***)

Assessment Evidence	
Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Warm Ups, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research
Summative	In correlation with the NJSLS, students must demonstrate the following as summative assessments: • 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-ESS3-3., Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. • MS-ESS3-4., Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. • MS-ESS3-5., Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. Other summative assessments will include but are not limited to: lesson activities, summative tests, lab skills, demonstrations, and vocabulary quizzes.
Alternative and Benchmark	Alternative - Read to the student and chart oral responses. Word banks, sentence frames, oral responses, graphic organizers, observations, portfolios of student work, orally administered assessments, and anecdotal notes. Benchmark – LinkIt Benchmark Assessment, Teacher Generated Assessments Formative, Summative, Alternative and Benchmark Assessments

Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Amplify Digital Curriculum, Generation Genius, BrainPop, Mystery Science, Microsoft 365, Primary and Secondary Source Documents, Lab Materials as needed, Approved Class Resource List, Amplify Readings, Labs, Simulations

Content & Interdisciplinary Standards

NJ 2020 SLS: Science

Standards

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 with no 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).]

MS-ESS3-3., Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

MS-ESS3-4., Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth’s systems as 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.]

MS-ESS3-5., Ask questions to clarify evidence of the factors that have caused the rise in global temperatures 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.]

Science and Engineering Practices

Analyzing and Interpreting Data - Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to determine similarities and differences in findings. (MS-ESS3-2)

Constructing Explanations and Designing Solutions - Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)

Engaging in Argument from Evidence - Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-ESS3-4)

Asking Questions and Defining Problems - 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.

- Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5)

Disciplinary Core Ideas (DCI)

ESS3.B: Natural Hazards

- 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. (MS-ESS3-2)

ESS3.C: Human Impacts on Earth Systems

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

ESS3.D: Global Climate Change

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

Crosscutting Concepts	
Patterns	Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2)
Cause and Effect	• Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3) • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-4)
Stability and Change	• Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)
Influence of Science, Engineering, and Technology on Society and the Natural World	• All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-4) • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-2),(MS-ESS3-3)

Science Addresses Questions About the Natural and Material World	• Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-ESS3-4)

NJ: 2016 SLS: English Language Arts & Companion Standards

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- NJSLA.SL.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
- NJSLA. SL.4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- NJSLA.SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2, (MS-LS1-7)
- NJSA SL.6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate. clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized references materials, as appropriate.

- NJSLA.L.6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

NJ: 2016 SLS: Mathematics

- 6.NS.3: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- 6.NS.7.d: Distinguish comparisons of absolute value from statements about order.
- 6.NS.7b: Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- 6.NS.C.5, Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-ESS2-5)
- 6.RP.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- 6.RP.A.1 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.3.d: Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
- 6.RP.3c: Find a percent of a quantity as a rate per 100; solve problems involving finding the whole given a part and the percent.
- 6.SP.5: Summarize numerical data sets in relation to their context.
- 6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4), (MS-LS1-5)
- 6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4), (MS-LS1-5)
- 6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-2), (MS-ESS1-4)
- 6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1), (MS-LS1-2), (MS-LS1-3), (MS-LS1-6)
- MP.2 Reason abstractly and quantitatively. (MS-ESS1-3)
- MP.4 Model with mathematics. (MS-LS3-2)

2020 SLS: Computer Science & Design Thinking	
NJSLS Performance Expectations (By the end of 8th Grade)	
• 8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies. • 8.2.8.EC.2: Examine the effects of ethical and unethical practices in product design and development.	
2020 SLS: Career Readiness, Life Literacies, and Key Skills	
NJSLS Performance Expectations (By the end of 8th Grade)	
• 9.4.8.TL.4 Synthesize and publish information about a local or global issue or event. • 9.4.8.IML.1 Ask insightful questions to organize different types of data and create meaningful visualizations. • 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.	
Interdisciplinary/21st Century Connections	
21st Century Connections	• Critical thinking • Collaboration and Teamwork • Problem Solving
Math	• See Above
SEL	• Self-Awareness • Responsible Decision-Making • Relationship Skills • Social Awareness New Jersey Social and Emotional Learning Competencies and Sub Competencies.docx

Title	Plate Motion Engineering Internship
Unit Duration	6 Weeks

Unit Summary & Rationale	***In the Plate Motion Engineering Internship, students will consider the design problem of how to protect people from these natural hazards, using historical data about the frequency of different magnitudes of earthquakes along the plate boundaries in the Indian Ocean region. Specifically, students work as geohazards engineering interns to design a tsunami warning system. They will use a digital model to simulate placing earthquake, deep water, and shallow water sensors at various places in the Indian Ocean region in order to maximize the response time people receive to get to safety, minimize the number of false alarms so people don't become complacent and resources are not wasted from evacuating unnecessarily, and minimize the cost so local governments can afford to install the warning system and maintain it for many years to come.***
Unit Goals	
Essential Questions	• What is a tsunami? • How does an earthquake occur? • What can prevent damage from a natural disaster? • How does a tsunami react different in water depth?
Enduring Understandings	• A tsunami wave can result in severe damage due to rapid flooding of land. • Tsunamis can be smaller and only affect nearby areas, or they can be large enough to travel across the ocean. • Most dangerous ocean-wide tsunamis occur from an earthquake of 8.0 magnitude or greater at a convergent plate boundary.
Learning Outcomes	• Demonstrate understanding of geography. • Explain what is a tsunami. • Explain what causes a tsunami. • Research, design, and create proposal to prevent natural disasters. • Be able to ask questions and develop models • Analyze and interpret data on earthquakes and tsunami waves.
Assessment Evidence	
Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Warm Ups, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research

Summative	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. MS-ETS1-4., Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. MS-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. 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. Other summative assessments will include but are not limited to: lesson activities, summative tests, lab skills, demonstrations, and vocabulary quizzes.
Alternative and Benchmark	Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Amplify Digital Curriculum, Generation Genius, BrainPop, Mystery Science, Microsoft 365,

	Primary and Secondary Source Documents, Lab Materials as needed, Approved Class Resource List, Amplify Readings, Labs, Simulations

Content & Interdisciplinary Standards

NJ 2020 SLS: Science

Standards

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.

MS-ETS1-4., Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

MS-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.]

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.]

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.]

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.]

Science and Engineering Practices

Asking Questions and Defining Problems - 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.

- 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. (MS-ETS1-1)
- Developing and Using Models
- Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
- Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)

Analyzing and Interpreting Data - Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)
- Engaging in Argument from Evidence
- Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.
- Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)
- Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3)

Developing and Using Models - Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena. (MS-ESS1-1),(MS-ESS1-2)
- Analyzing and Interpreting Data
- Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
- Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)

Disciplinary Core Ideas (DCI)

ETS1.A: Defining and Delimiting Engineering Problems

- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)

ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)
- Models of all kinds are important for testing solutions. (MS-ETS1-4)

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. (MS-ETS1-3)
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)

ESS1.A: The Universe and Its Stars

- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)
- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)

ESS1.B: Earth and the Solar System

- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MS-ESS1-3)

- This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1)
- The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)

ESS1.C: The History of Planet Earth

- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE),(secondary to MS-ESS2-3)

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

- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)

Crosscutting Concepts	
Influence of Science, Engineering, and Technology on Society and the Natural World	• All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1) • 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. (MS-ETS1-1)
Patterns	• Patterns can be used to identify cause-and-effect relationships. (MS-ESS1-1) • Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3)
Scale, Proportion, and Quantity	• Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3)
Systems and System Models	• Models can be used to represent systems and their interactions. (MS-ESS1-2)

Interdependence of Science, Engineering, and Technology	• Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (MS-ESS1-3)
Scientific Knowledge Assumes an Order and Consistency in Natural Systems	• Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1-1),(MS-ESS1-2)

NJ: 2016 SLS: English Language Arts & Companion Standards

- NJSLA.W.1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- NJSLA. W.2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts.
- RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.
- RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.
- RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
- RST.6-8.6: Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
- RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

- RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
- RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3), (MS-LS1-4)
- WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- WHST.6-8.1: Write arguments focused on discipline-specific content.
- WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- WHST.6-8.1b: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic.
- WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research.
- NJLA.SL.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- NJSLA.SL.2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- NJSLA.SL.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
- NJSLA. SL.4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- NJSLA.SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2, (MS-LS1-7)

- NJSA SL.6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate. clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized references materials, as appropriate.
- NJSLA.L.6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

NJ: 2016 SLS: Mathematics

- 6.NS.3: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- 6.NS.7.d: Distinguish comparisons of absolute value from statements about order.
- 6.NS.7b: Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- 6.RP.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- 6.RP.A.1 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.3.d: Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
- 6.RP.3c: Find a percent of a quantity as a rate per 100; solve problems involving finding the whole given a part and the percent.
- 6.SP.5: Summarize numerical data sets in relation to their context.
- 6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4), (MS-LS1-5)
- 6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4), (MS-LS1-5)
- 6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-2), (MS-ESS1-4)
- 6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1), (MS-LS1-2), (MS-LS1-3), (MS-LS1-6)
- 7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-ESS1-1), (MS-ESS1-2), (MS-ESS1-3)

- 7.NS.2: Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
- 7.NS.3: Solve real-world and mathematical problems involving the four operations with rational numbers.
- 7.SP.1: Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
- 7.EE.B.6 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS1-2), (MS-ESS1-4)
- MP.2 Reason abstractly and quantitatively. (MS-ESS1-3)
- MP.4 Model with mathematics. (MS-LS3-2)

2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

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

2020 SLS: Career Readiness, Life Literacies, and Key Skills

NJSLS Performance Expectations (By the end of 8th Grade)

- 9.4.8.TL.4 Synthesize and publish information about a local or global issue or event.
- 9.4.8.IML.1 Ask insightful questions to organize different types of data and create meaningful visualizations.
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Interdisciplinary/21st Century Connections

21st Century Connections	• Critical thinking • Collaboration and Teamwork • Problem Solving
Math	• See Above
SEL	• Self-Awareness • Responsible Decision-Making • Self-Management • Relationship Skills

	• Social Awareness New Jersey Social and Emotional Learning Competencies and Sub Competencies.docx

Title	Earth's Changing Climate Engineering Internship
Unit Duration	2 Weeks
Unit Summary & Rationale	***In this unit, students are immersed in an Engineering Internship. As civil engineering interns students will learn about The Design Cycle and apply their understanding of energy and climate science to create roof modification designs for a city in the desert.***
Unit Goals	
Essential Questions	• What is global warming? • What is an ice age? • What factors contribute to the planet warming? • What protects us from the sun? • What is a fossil fuel? • What are greenhouse gases? • What is green energy?
Enduring Understandings	• Climate scientists and atmospheric scientists study global warming. • The o-zone layer is made up of gases. • Light surfaces tend to have a high albedo. • The carbon cycle is a process by which carbon travels through the biosphere, geosphere, hydrosphere, and atmosphere.
Learning Outcomes	• Be able to ask questions and develop models • Analyze and interpret data • Use models to test ideas and gather evidence. • Construct arguments.
Assessment Evidence	

Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Warm Ups, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research
Summative	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. MS-ETS1-4., Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. Other summative assessments will include but are not limited to: lesson activities, summative tests, lab skills, demonstrations, and vocabulary quizzes.
Alternative and Benchmark	Alternative - Read to the student and chart oral responses. Word banks, sentence frames, oral responses, graphic organizers, observations, portfolios of student work, orally administered assessments, and anecdotal notes. Benchmark – LinkIt Benchmark Assessment, Teacher Generated Assessments Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Amplify Digital Curriculum, Generation Genius, BrainPop, Mystery Science, Microsoft 365, Primary and Secondary Source Documents, Lab Materials as needed, Approved Class Resource List, Amplify Readings, Labs, Simulations

Content & Interdisciplinary Standards
NJ 2020 SLS: Science
Standards
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. MS-ETS1-4., Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. MS-ESS3-3., Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).] MS-ESS3-5., Ask questions to clarify evidence of the factors that have caused the rise in global temperatures 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.]
Science and Engineering Practices
Asking Questions and Defining Problems - 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. • 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. (MS-ETS1-1)

Developing and Using Models - Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)

Analyzing and Interpreting Data - Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)

Engaging in Argument from Evidence - Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.

- Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)

Constructing Explanations and Designing Solutions - Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Apply scientific principles to design an object, tool, process or system. (MS-ESS-3)

Asking Questions and Defining Problems - 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.

- Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5)

Planning and Carrying Out Investigations - Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

- 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. (MS-ESS2-5)

Disciplinary Core Ideas (DCI)

ETS1.A: Defining and Delimiting Engineering Problems

- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)

ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)

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

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. (MS-ETS1-3)
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)

ESS3.C: Human Impacts on Earth Systems

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

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

- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5)

ESS2.D: Weather and Climate

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

ESS3.D: Global Climate Change

- Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering

capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)	
Crosscutting Concepts	
Influence of Science, Engineering, and Technology on Society and the Natural World	• All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1) • 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. (MS-ETS1-1)
Cause and Effect	• Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3) • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)
Connections to Engineering, Technology, and, Applications of Science	• The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-3)
Stability and Change	• Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)
Systems and System Models	• Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)
NJ: 2016 SLS: English Language Arts & Companion Standards	
• NJSLA.W.1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.	

- NJSLA. W.2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts.
- RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.
- RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.
- RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
- RST.6-8.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
- RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
- RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
- RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3), (MS-LS1-4)
- WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- WHST.6-8.1: Write arguments focused on discipline-specific content.
- WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- WHST.6-8.1b: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic.
- WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research.
- NJLA.SL.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- NJSLA.SL.2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- NJSLA.SL.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
- NJSLA. SL.4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- NJSLA.SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2, (MS-LS1-7)
- NJSA SL.6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate. clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized references materials, as appropriate.
- NJSLA.L.6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

NJ: 2016 SLS: Mathematics

- 6.NS.3: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- 6.NS.7.d: Distinguish comparisons of absolute value from statements about order.
- 6.NS.7b: Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- 6.RP.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- 6.RP.A.1 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.3.d: Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
- 6.RP.3c: Find a percent of a quantity as a rate per 100; solve problems involving finding the whole given a part and the percent.
- 6.SP.5: Summarize numerical data sets in relation to their context.
- 6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4), (MS-LS1-5)
- 6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4), (MS-LS1-5)
- 6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-2), (MS-ESS1-4)
- 6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1), (MS-LS1-2), (MS-LS1-3), (MS-LS1-6)
- MP.2 Reason abstractly and quantitatively. (MS-ESS1-3)
- MP.4 Model with mathematics. (MS-LS3-2)

2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

- 8.1.8.IC.2: Describe issues of bias and accessibility in the design of existing technologies.
- 8.1.8.DA.4: Transform data to remove errors and improve the accuracy of the data for analysis.
- 8.1.8.DA.6: Analyze climate change computational models and propose refinements.
- 8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values.
- 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.
- 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
- 8.2.8.ITH.2: Compare how technologies have influenced society over time.
- 8.2.8.ITH.3: Evaluate the impact of sustainability on the development of a designed product or system.
- 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact.

- 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another.
- 8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies.

2020 SLS: Career Readiness, Life Literacies, and Key Skills

NJSLS Performance Expectations (By the end of 8th Grade)

- 9.1.8.CP.1: Compare prices for the same goods or services
- 9.1.8.EG.5: Interpret how changing economic and societal needs influence employment trends and future education.
- 9.1.8.EG.6: Explain the economic principle of the circular flow of money in different situations regarding buying products or services from a local or national business and buying imported or domestic goods.
- 9.1.8.EG.8: Analyze the impact of currency rates over a period of time and the impact on trade, employment, and income.
- 9.1.8.FP.2: Evaluate the role of emotions, attitudes, and behavior (rational and irrational) in making financial decisions.
- 9.1.8.PB.1: Predict future expenses or opportunities that should be included in the budget planning process.
- 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest.
- 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
- 9.2.8.CAP.5: Develop a personal plan with the assistance of an adult mentor that includes information about career areas of interest, goals and an educational plan.
- 9.2.8.CAP.10: Evaluate how careers have evolved regionally, nationally, and globally.
- 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4)
- 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
- 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
- 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).
- 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Interdisciplinary/21st Century Connections

21st Century Connections	• Critical thinking • Collaboration and Teamwork • Problem Solving
Math	• See Above

Accommodations & Modifications		
Special Education Students, 504 students, English Language Learners, Students at-Risk Based on Students' Individual Needs		
Time/General	**Processing**	**Comprehension**
• Allow extra time • Repeat and clarify directions • Provide breaks in between tasks • Have student verbalize directions • Provide timelines/due dates for reports and projects	• Provide extra response time • Have student verbalize steps • Repeat directions • Provide small group instruction • Include partner work	• Provide reading material on student's level • Have student underline important points • Assist student on how to use context clues to identify words/phrases • Ensure short manageable tasks
Tests/Quizzes/Grading	**Behavior/Attention**	**Organization**
• Provide extended time • Provide study guides • Limit number of responses	• Establish classroom rules • Write a contract with the student specifying expected behaviors • Provide preferential seating • Re-focus student as needed • Reinforce student for staying on task	• Monitor the student and provide reinforcement of directions • Verify the accurateness of homework assignments • Display a written agenda

ELL, Enrichment, Gifted & Talented Strategies

Accommodations Based on Students' Individual Needs

ELL Strategies

- Provide explicit, systematic instruction in vocabulary.
- Ensure that ELLs have ample opportunities to talk with both adults and peers and provide ongoing feedback and encouragement.
- Expose ELLs to rich language input.
- Scaffolding for ELLs language learning.
- Encourage continued L1 language development.
- Alphabet knowledge
- Phonological awareness
- Print awareness
- Design instruction that focuses on all of the foundational literacy skills.
- Recognize that many literacy skills can transfer across languages.
- English literacy development by helping ELLs make the connection between what they know in their first language and what they need to know in English.
- Graphic organizers
- Modified texts
- Modified assessments
- Written/audio instruction
- Shorter paragraph/essay length
- Homogeneously grouped by level

Accommodations Based on Students' Individual Needs:

Enrichment Strategies

- Evaluate vocabulary

- Elevate Text Complexity
- Incorporate inquiry based assignments and projects
- Extend curriculum
- Balance individual, small group and whole group instruction
- Provide tiered/multi-level activities
- Include purposeful learning centers
- Provide open-ended activities and projects
- Offer opportunities for heterogeneous grouping to work with age and social peers as well as homogeneous grouping to provide time to work with individual peers
- Provide pupils with experiences outside the 'regular' curriculum
- Alter the pace the student uses to cover regular curriculum in order to explore topics of interest in greater depth/breadth within their own grade level
- Require a higher quality of work than the norm for the given age group
- Promote higher level of thinking and making connections.
- Focus on process learning skills such as brainstorming, decision making and social skills
- Use supplementary materials in addition to the normal range of resources.
- Encourage peer to peer mentoring
- Integrate cross-curricular lessons
- Incorporate real-world problem solving activities
- Facilitate student-led questioning and discussions

Gifted & Talented Strategies

- More elaborate, complex, and in-depth study of major ideas, problems, and themes that integrate knowledge within and across systems of thought.
- Development and application of productive thinking skills to enable students to reconceptualize existing knowledge and/or generate new knowledge.
- Explore constantly changing knowledge and information and develop the attitude that knowledge is worth pursuing in an open world.
- Encourage exposure to, selection, and use of appropriate and specialized resources.

- Promote self-initiated and self-directed learning and growth.
- Provide for the development of self-understanding and the understanding of one's relationship to persons, societal institutions, nature, and culture.
- Flexible pacing
- Use of more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace. If they master a particular unit, they need to be provided with more advanced learning activities, not more of the same activity.
- Questions that require a higher level of response and/or open-ended questions that stimulate inquiry, active exploration, and discovery.
- Encourage students to think about subjects in more abstract and complex ways
- Activity selection based on student interests, that encourage self-directed learning
- Group interaction and simulations
- Guided self-management
- Encourage students to demonstrate what they have learned in a wide variety of forms that reflect both knowledge and the ability to manipulate ideas.
- Engage students in active problem-finding and problem-solving activities and research.
- Provide students opportunities for making connections within and across systems of knowledge by focusing on issues, themes, and ideas.