West Windsor-Plainsboro Regional School District
Course Title: Science
Grade: 8

The Mission of the West Windsor-Plainsboro Science Department

Our mission is to cultivate science learners who have the foundational knowledge to make ethical, scientifically literate decisions and the ability to apply scientific practices in order to contribute to the needs of society and a changing world.

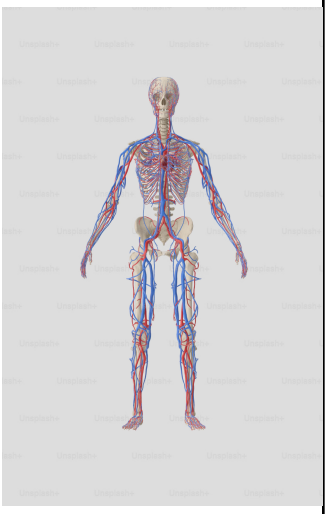
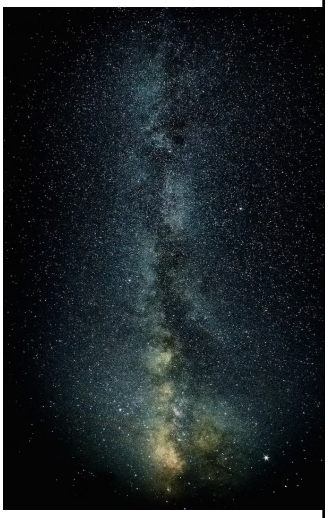
- **Vision**

  We envision a K-12 science experience that supports and challenges every student in their science learning journey. We will:
  - *Capitalize on diversity by reaching and exciting students at all levels and interests by differentiating learning within classrooms and by offering a robust program of studies.*
  - *Emphasize authentic science and engineering practices and leverage the interdisciplinary nature of science with arts, technology, math, reading, and writing.*
  - *Integrate scientific knowledge and 21st century competencies to prepare students to make informed decisions and take action to address real world problems.*
  - *Cultivate an inclusive and diverse community where all learners are welcomed, valued, respected, and celebrated.*

8th Grade Science Storyboard

Essential Questions:

- How do the brain and the nervous system affect how we experience the world?
- How do chemical reactions affect the Earth's systems?
- How can we transform energy in order to combat the rise in global temperatures?
- What is our place in the universe?

Unit 1: Exploring the Wonders of the Nervous System	**Unit 2:** Unlocking the Secrets of Chemistry	**Unit 3:** Illuminating the Secrets of Light & the Electromagnetic Spectrum	**Unit 4:** Discovering the Mysteries of the Universe
			
THE FOCUS OF THE STORY	**THE FOCUS OF THE STORY**	**THE FOCUS OF THE STORY**	**THE FOCUS OF THE STORY**
Together, we'll examine how the human brain handles information and help us understand the world around us. First, we'll learn about the different parts of the nervous system and what they do. From the brain to the nerves, we'll discover how they work together like a team. We will incorporate the disability curriculum component into this unit as well. (See link) We'll also find out how information travels from the world around us to our brain and then back out to make things happen. Then, we'll explore how our senses help us experience	Let's unlock the secrets of chemistry by exploring how much in the natural world can be explained by various arrangements of great numbers of small moving and invisible atoms. First, we'll begin with what we already know about matter and its different forms, like solid, liquid and gas. We'll also learn about phase changes, which are when matter changes from one state to another, like when ice melts into water or water evaporates into steam. Then we'll figure out the differences between phase changes and chemical reactions. A chemical	How does energy affect our planet? Although the Sun is the ultimate source of energy, we'll also discover different technologies and alternative energy sources that can help us tackle the rise of global temperatures. We'll conduct experiments to observe, predict, measure, record, and analyze how light and energy affect our environment. We'll also determine the impact of human activities on the environment including greenhouse gasses and light pollution. Get ready to have	In our study of astronomy, we'll discover that the same rules of matter, energy, and forces apply everywhere in the Universe, regardless of size! We'll learn how gravity affects objects in our solar system, galaxy, and beyond, and even be able to predict how things move in their orbits. We'll also explore how we can use technology such as satellites and spectroscopes to analyze light to identify solutions for issues like greenhouse gas emissions. Gain a better understanding of the

the world. We'll talk about sight, hearing, taste, smell, and touch, and how they're all connected to our brain. You'll start to see how the science of our brain relates to your daily life, and make fascinating connections between science and our own amazing minds!	reaction is when different substances combine and create new substances. For example, if you mix vinegar and baking soda, they produce a fizzing and bubbling reaction and become what is called sodium acetate. Lastly, we'll explore how these types of chemical reactions can affect our world by studying emissions data and how they cause significant changes to the Earth's systems.	a better understanding of how energy works, and to come up with some solutions to real-world problems like climate change!	universe, our place in it, and how we can protect it!
LEARNING TARGETS	**LEARNING TARGETS**	**LEARNING TARGETS**	**LEARNING TARGETS**
I can explain how the structure of a biological feature is directly related to the function. I can determine how external factors influence the brain and the body's interconnected systems. I can make connections between my personal experiences and the science of the brain.	I can conduct experiments that illustrate physical changes and chemical changes. I can analyze and interpret data from chemical experiments and explain the significance of the outcomes. I can make connections between what I know about chemistry, and how it impacts both human beings and the natural world.	I can demonstrate my understanding that energy cannot be created or destroyed, but only changed from one form to another. I can examine data and provide evidence and reasoning to determine how alternative and/or renewable energy sources may be a solution to current global climate issues and concerns. I can explain how humans can combat the rise in global temperature while maintaining energy costs.	I can conduct experiments that demonstrate how gravity is the force that organizes the universe and causes objects to move in a regular and predictable motion. I can analyze and interpret data to determine scale properties of objects in the solar system. I can explain that the earth, sun and moon work as a system that produces seasons, tides, moon phases and day/night which also influences climate and weather patterns.

Unit 1: Nervous System	
Content Area: Science	
Course & Grade Level: 8th Grade Science	
Summary and Rationale	
The eighth grade science program is based on understanding the structure of the universe, physical principles on which it operates, and our place in it. Students identify, understand and connect important themes and patterns in the living and non-living world through the analysis and observation of phenomena. For example, how do the intricacies of the nervous system tie into our study of chemistry (unit 2) ? And how can chemistry then be applied to the concept of energy transformations in the following Light Unit (unit 3) Students can then apply their knowledge and skills from the first 3 units to our study of Astronomy. The Nervous System unit explores how humans process information to make sense of the world via interactions of our sensory systems and physical environmental stimuli. These understandings include the structure and function of the nervous systems and its components, as well as the direction and means of information flow from environment to brain to effectors. In exploring both the sensory and motor functions of the nervous system, students can make connections between their personal experience and the science of their brain. Students will be able to transfer their understanding of the nervous system and the interconnectedness of the body systems and apply it to how we are impacted by and connected to environmental or geographical factors such as the effects of climate change. Students will research to find understanding of the impacts of pollution on body systems, as well as the systemic factors that impact exposure to pollution.	
Recommended Pacing	
30 days	
New Jersey Student Learning Standards for The Nervous System	
CPI #	**Cumulative Progress Indicator (CPI)**
MS-LS1-3	**Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.** *[Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]*
MS-LS1-8	**Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.** *[Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]*
MS-ESS3-5	**Ask questions to clarify evidence of the factors that have caused climate change over the past century.** *[Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gasses 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.]*
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
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	Write arguments focused on discipline content.
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.
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
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.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.1	Critically curate multiple resources to assess the credibility of sources when searching for information.
9.4.8.IML.2	Identify specific examples of distortion, exaggeration, or misrepresentation of information.
9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).
9.4.8.IML.8	Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b).
9.4.8.IML.9	Distinguish between ethical and unethical uses of information and media (e.g., 1.5.8.CR3b, 8.2.8.EC.2).
9.4.8.TL.1	Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
New Jersey Student Learning Standards for Computer Science and Design Thinking	
CPI #	**Cumulative Progress Indicator (CPI)**
8.1.2.DA.1:	Collect and present data, including climate change data, in various visual formats.
8.1.2.DA.3:	Identify and describe patterns in data visualizations.
8.1.2.DA.4:	Make predictions based on data using charts or graphs.
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
Interdisciplinary Standards (Math and Social Studies)	
CPI #	**Cumulative Progress Indicator (CPI)**
Mathematics - N/A	
6.1 U.S. History	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.

6.3 U.S. History	Active Citizenship in the 21st Century: All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.

Instructional Focus

Unit Enduring Understandings

- The brain is the control center of the human body and is composed of many specialized cells.
- The structure of a biological feature is directly related to the function.
- The human brain can be impacted by external factors (like pollution, drug use/exposure, and noise) which can impact the other interconnected systems in the body. (**MS-ESS3-5, MS-LS1-3)**

Unit Essential Questions

- Which process do you think is more vital - sensory or motor impulses?
- In what ways can the brain be considered the most important human organ?
- How do the differences in structure relate to the function of the biological features of the nervous system?
- How does the amount of air pollution someone is exposed to impact their brain and body systems? (**MS-ESS3-5, MS-LS1-3)**

Objectives

General for all Units:

- Ask questions and define problems
- Develop and use models
- Plan and carry out investigations
- Analyze and interpret data and communicate information using a variety of modalities.
- Using mathematics and computational thinking to support scientific conclusion
- Construct explanations and design solutions for complex and real world problems
- Engage in argument from evidence
- Obtain, evaluate, and communicate information

Evidence of Learning (include sample assessments in each corresponding check box row)

☑ **Formative Assessment**

- **QFT:** Phenomena could include these examples: MS-LS1-3, MS-LS1-8
- **Modeling neurons: (MS-LS1-3 and MS-LS1-5)**
- **Research opportunity: (MS-ESS3-5, MS-LS1-3)**

☑ **Summative Assessment**

- **Design tools: (MS-LS1-3)**
- **Brain Investigations: (MS-LS1-5)**
- **Senses Investigation: (MS-LS1-3) (MS-LS1-8)**

☑ **Alternative Assessment -** Assessments will be differentiated in various ways based on the needs of the students. Differentiation could be in…

- Content (texts, phenomena, graphs, data tables, vocabulary, etc.)
- Process (scaffolding, guiding questions, small group instruction, etc.)
- Product (individual components, student choice in modality such as video, skit, etc)

☑ **Benchmark -** pending redesign in future curriculum projects

- **Senses Investigation: (MS-LS1-3) (MS-LS1-8)**

Assessment Statement for Science Curriculum

The assessment plan includes teacher-designed formative and summative assessments, including common assessments, self-assessments, and performance tasks aligned with the NJSLS-S and the NJSLS-S for Climate Change. During each common, formative, and summative assessment, teachers will provide alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative assessments are individualized for the needs of all students. Accommodations

Resources

Core Text:

Suggested Resources:
Phenomena
https://thewonderofscience.com/

Research on climate change and the brain:
Climate Change and a Child's Brain
How Air Pollution Threatens Brain Health
The Brain and Climate Change

Technology based lessons:
Gizmos - "Senses", "Eyes and vision", "Reaction Time 1"
GoFormative use for Assessments

Videos and Websites for Content/Simulations:
Brain Connection
Cow Eye Dissection

Unit 2: CHEMISTRY	
Content Area: Science	
Course & Grade Level: 8th Grade Science	
Summary and Rationale	
In this unit, students should grasp the idea that much in the natural world can be explained by various arrangements of great numbers of small moving and invisible atoms. Building on students' understanding of states of matter and phase changes, students will plan and carry out investigations to differentiate between physical changes (phase changes) and chemical reactions (reactions between substances that result in new substances different from the reactants). In doing so students will create models and use evidence to demonstrate Conservation of Energy and Conservation of Mass/Matter. As students solidify their understanding of chemical reactions, students will use that knowledge to understand the human impact on the chemical compounds that impact our world. Students will analyze emissions data from a chemistry lens and dissect the chemical processes that cause large scale change to the earth's systems.	
Recommended Pacing	
40 Days	
New Jersey Student Learning Standards for Chemistry	
CPI #	**Cumulative Progress Indicator (CPI)**
MS-PS1-1	**Develop models to describe the atomic composition of simple molecules and extended structures.** *[Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.]*
MS-PS1-2	**Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.** *[Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.] [Assessment Boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.]*
MS-PS1-3	**Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.** *[Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.]*
MS-PS1-4	**Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.** *[Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]*

MS-PS1-5	**Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.** *Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.] [Assessment Boundary: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.]*
MS-PS1-6	**Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.** *[Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.] [Assessment Boundary: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.]*
MS-ESS3-5	**Ask questions to clarify evidence of the factors that have caused climate change over the past century.** *[Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gasses 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.]*
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
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 a text on the same topic.
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.
6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems
New Jersey Student Learning Standards for Computer Science and Design Thinking	
CPI #	**Cumulative Progress Indicator (CPI)**
8.1.2.DA.1:	Collect and present data, including climate change data, in various visual formats.
8.1.2.DA.3:	Identify and describe patterns in data visualizations.
8.1.2.DA.4:	Make predictions based on data using charts or graphs.
8.1.5.DA.1:	Collect, organize, and display data in order to highlight relationships or support a claim.
8.1.5.DA.4:	Organize and present climate change data visually to highlight relationships or support a claim.
8.2.5.ED.2:	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
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.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.1	Critically curate multiple resources to assess the credibility of sources when searching for information.
9.4.8.IML.2	Identify specific examples of distortion, exaggeration, or misrepresentation of information.
9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH.IPRET.8).
9.4.8.IML.8	Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b).
9.4.8.IML.9	Distinguish between ethical and unethical uses of information and media (e.g., 1.5.8.CR3b, 8.2.8.EC.2).
9.4.8.TL.1	Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
Interdisciplinary Standards (Mathematics and Social Studies)	
CPI #	**Cumulative Progress Indicator (CPI)**
Math MP.2	Reason abstractly and quantitatively.
Math MP.4	Model with mathematics.
Math 7.EE.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
U.S History 6.1	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.
U.S History 6.3	Active Citizenship in the 21st Century: All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.
Instructional Focus	
Unit Enduring Understandings	
1. The Periodic Table organizes elements according to their structure; structure determines properties. Matter is electrical in nature, and made of particles that are in constant motion. 2. Multiple pieces of evidence can be used to determine physical and chemical changes. 3. Energy is involved in all chemical reactions. 4. The total of the mass plus energy involved in any reaction or change is conserved. 5. Energy can be transformed. Chemical reactions among substances cause changes producing new products. 6. When atoms come together in a specific way, they can create molecules that impact the earth's temperature. (**MS-ESS3-5, MS-PS1-1)**	

7. Human-correlated actions like farming, use of cars, and large-scale manufacturing can produce certain molecules in high concentrations that can alter the earth's natural processes. **(MS-ESS3-5)**

Unit Essential Questions

1. Why are elements likely to bond with groups of specific elements, but will act inert towards other groups of elements? (**MS-PS1-1)**
2. How can you tell the difference between a chemical and physical change? (**MS-PS1-2)**
3. How does the atomic structure of an atom relate to its ability to bond with itself and other atoms? (**MS-PS1-1)**
4. How does the law of conservation of energy differ from the law of conservation of mass? (**MS-PS1-5)**
5. How do humans impact the types of molecules that are abundant in our world?(**MS-ESS3-5)**
6. Why do certain molecules have the ability to impact the earth's natural processes when produced in large quantities? **(MS-ESS3-5)**

Evidence of Learning (include sample assessments in each corresponding check box row)

☑ **Formative Assessment**

- **QFT:** Phenomena could include these examples: MS-PS1-1; MS-PS1-2; MS-PS1-3; MS-PS1-4 MS-PS1-5; MS-PS1-6; MS-PS3-4; MS-PS 3-5; MS-ESS 3-5
- **Modeling Conservation of Mass:** (**MS-PS1-5)**
- **Transition to light**: **(MS-ESS3-5)**

☑ **Summative Assessment**

- **Chemical Physical Change CER:** (**MS-PS1-2)**
- **Exothermic/Endothermic Design Challenge:** (**MS-PS1-6)**
- **Thermal Energy:** (**MS-PS3-4)**

☑ **Alternative Assessment:**

Assessments will be differentiated in various ways based on the needs of the students. Differentiation could be in…

- Content (texts, phenomena, graphs, data tables, vocabulary, etc.)
- Process (scaffolding, guiding questions, small group instruction, etc.)
- Product (individual components, student choice in modality such as video, skit, etc)

Examples: **Chemical Physical Change CER**

- **Thermal Energy:** use a graphic organizer to help write CER.

☑ **Benchmark: <u>Climate Change Common Assessment Task</u>**:

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).]

<u>Assessment Statement for Science Curriculum</u>

The assessment plan includes teacher-designed formative and summative assessments, including common assessments, self-assessments, and performance tasks aligned with the NJSLS-S and the NJSLS-S for Climate Change. During each common, formative, and summative assessment, teachers will provide alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative assessments are individualized for the needs of all students. Accommodations

Resources

Core Text:

Phenomena

https://thewonderofscience.com/

Technology based lessons:

- Gizmos - “Chemical and Physical Changes STEM Case”, “Chemical Changes”, “Balancing Chemical Equations”, “Electrons and Chemical Reactions”
- GoFormative use for modeling chemical equations and assessments

Climate Change Specific Resources:
NASA Ozone and Gasses
https://climate.nasa.gov/

Websites for Lesson Planning:
BOEING Alternative Energy Design (10 Day Unit)
PBS Chemistry
Vision Learning

Unit 3: Light: Energy and the Electromagnetic Spectrum	
Content Area: Science	
Course & Grade Level: 8th Grade Science	
Summary and Rationale	
The unit connects to the conservation of energy from Chemistry to a deep understanding of energy transformations related to the Sun (as the ultimate energy source on Earth), current and developing technologies, as well as the application of alternative energy sources to combat local and global climate issues. Students will be able to utilize cross cutting concepts focusing on energy and matter, cause and effect, patterns, systems and system models, as well as stability and change while making connections to the greenhouse effect. The electromagnetic spectrum (EMS) is made up of the various types of radiation with different behaviors, uses, and other quantifiable properties; students will explore these waves and their uses. This unit allows students to observe, measure, record, and predict the path of visible light (part of EMS) under many conditions. Students will make the connection between the color they observe and the visible light wavelengths that are reflected off an object to their eye. Additionally, students will be able to gather data to support the argument that greenhouse gasses absorb energy in the infrared range of the EMS. Students will also make local and global connections in terms of human impact on the environment, greenhouse gasses, light pollution, and propose solutions to real world problems including climate change.	
Recommended Pacing	
40 Days	
New Jersey Student Learning Standards for Light: Energy and the Electromagnetic Spectrum	
CPI #	**Cumulative Progress Indicator (CPI)**
MS-PS3-3	**Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.** *[Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]*
MS-PS3-4:	**Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample**. *[Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]*
MS-PS3-5	**Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.** *[Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [Assessment Boundary: Assessment does not include calculations of energy.]*
MS-PS4-1	**Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave** **.***[Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.] [Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.]*

MS-PS4-2	**Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials**. *[Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]*
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 gasses 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.]*
MS-ESS3-1	**Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.** *[Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]*
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
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.6-8.9	Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on the same topic.
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
9.4.8.CI.2	Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3)

9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
9.4.8.DC.1	Analyze the resource citations in online materials for proper use.
9.4.8.DC.2	Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8).
9.4.8.DC.8	Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).
9.4.8.GCA.1	Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a)
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.1	Critically curate multiple resources to assess the credibility of sources when searching for information
9.4.8.IML.2	Identify specific examples of distortion, exaggeration, or misrepresentation of information.
9.4.8.IML.5	Analyze and interpret local or public data sets to summarize and effectively communicate the data.
9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH.IPRET.8).
9.4.8.IML.8	Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b).
9.4.8.IML.12	Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience
9.4.8.IML.14	Analyze the role of media in delivering cultural, political, and other societal messages.
9.4.8.TL.1	Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
9.4.8.TL.4	Synthesize and publish information about a local or global issue or event (e.g., MS-LS4-5, 6.1.8.CivicsPI.3).
9.4.8.TL.6	Collaborate to develop and publish work that provides perspectives on a real-world problem.
New Jersey Student Learning Standards for Computer Science and Design Thinking	
CPI #	**Cumulative Progress Indicator (CPI)**
8.1.2.DA.3	Identify and describe patterns in data visualizations.
8.1.2.DA.4	Make predictions based on data using charts or graphs.
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
8.1.5.DA.4	Organize and present climate change data visually to highlight relationships or support a claim.
Interdisciplinary Standards (Mathematics and Social Studies)	
CPI #	**Cumulative Progress Indicator (CPI)**
Math MP.2	Reason abstractly and quantitatively.
Math MP.4	Model with mathematics.

Math 6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
Math 6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems.
Math 7.RP.A.2	Recognize and represent proportional relationships between quantities.
Math 8.F.A.3	Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.
U.S. History 6.1	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.
U.S History 6.3	Active Citizenship in the 21st Century: All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.

Instructional Focus

Unit Enduring Understandings

- Energy cannot be created or destroyed, but only changed from one form to another. Most of what goes on in the universe involves transformation of energy; heat energy is almost always a byproduct.
- The Sun is the ultimate source of energy on Earth - it is considered renewable.
- Alternative and/or renewable energy sources may be a solution to current global climate issues and concerns.
- The EMS is composed of a range of radiation with different properties; visible light can be detected by the human eye.
- The energy from the sun is transferred as heat energy into the earth's surface. **(MS-PS4-2)**
- The amount of heat that is trapped inside the earth's atmosphere is impacted by human activity. **(MS-ESS3-5, MS-PS4-2)**

Unit Essential Questions

- Is all the energy transformed "usable"?
- Can humans combat the rise in global temperature while maintaining energy costs?
- How is light produced and how does light travel?
- How does light interact with matter?
- Is a wavelength "invisible" simply because humans are unable to detect it?
- Do we all perceive color the same (way)?
- Are tools that utilize EMS radiation amongst the most applicable technologies in the modern world?
- How is the earth's atmosphere and interaction with EM radiation impacted by the emission of CO_2 and similar greenhouse gasses? **(MS-ESS3-5, MS-PS4-2)**

Objectives

<u>General for all Units</u>:

- Ask questions and define problems
- Develop and use models
- Plan and carry out investigations
- Analyze and interpret data and communicate information using a variety of modalities.
- Using mathematics and computational thinking to support scientific conclusion
- Construct explanations and design solutions for complex and real world problems
- Engage in argument from evidence

- Obtain, evaluate, and communicate information

Evidence of Learning (include sample assessments in each corresponding check box row)

☑ **Formative Assessment**
- **QFT:** Phenomena could include these examples: **MS-PS4-1, MS-PS4-2, MS-PS3-5 MS-ESS3-5**
- **Optics Design:** (**MS-PS4-2)**
- **Greenhouse Effect: (MS-PS4-2, MS-ESS3-5)**
- **NJ Emissions Data:** (**MS-ESS3-5)**
- **Light Pollution:** (**MS-ESS3-5)**
- **Transition to Astronomy Unit:**

☑ **Summative Assessment**
- **Design Challenge:** (**MS-PS3-3)**
- **Alternative Energy Plan/Essay**: **(MS-ESS3-3 and MS-ESS3-5)**

☑ **Alternative Assessment:** Assessments will be differentiated in various ways based on the needs of the students. Differentiation could be in…
- Content (texts, phenomena, graphs, data tables, vocabulary, etc.)
- Process (scaffolding, guiding questions, small group instruction, etc.)
- Product (individual components, student choice in modality such as video, skit, etc)

☑ **Benchmark:** pending redesign in future curriculum projects
- **Design Challenge:** (**MS-PS3-3)**

Assessment Statement for Science Curriculum

The assessment plan includes teacher-designed formative and summative assessments, including common assessments, self-assessments, and performance tasks aligned with the NJSLS-S and the NJSLS-S for Climate Change. During each common, formative, and summative assessment, teachers will provide alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative assessments are individualized for the needs of all students. Accommodations

Resources

Core Text:
Phenomena
https://thewonderofscience.com/

Suggested Resources:
Videos and Websites for Content/Simulations:
Energy Kids
EIA Energy
Physics Classroom
PhET Simulations
Facility Level Information on GreenHouse gasses Tool (FLIGHT)
Calculate Your Carbon Footprint
IPCC AR5 Synthesis Report
Climate Interactive
NASA Earth Observatory Airborne Nitrogen Dioxide Plummets Over China
NASA Video: Global warming from 1880-2020
National Geographic: Light Pollution
International Dark Sky Association
LightPollutionMap

Technology Based Lessons:
PhET Simulations: The Greenhouse Effect
Gizmos-"Energy Conversions", "Waves", "Laser Reflection", "Color Absorption"

GoFormative use for Assessments

Websites for Lesson Planning:
NASA Project Spectra
Teach Engineering
IPCC AR5 Synthesis Report
NSTA How Does a Pandemic Cause Less CO_2?
NSTA: Why Did Covid-19 Cause Environmental Changes?
NASA: Climate Change and Global Warming

Unit 4: Astronomy	
Content Area: Science	
Course & Grade Level: 8th Grade Science	
Summary and Rationale	
As human explorations advance, studying and understanding the Universe - its relevance, scale, and patterns that govern it - is increasingly important. In the Astronomy Unit, students will realize the scientific notion that the same physical principles of matter, energy, and forces apply everywhere despite the high differences in scale from planets to stars and beyond. Students will develop a deep understanding of the role of gravity in the universe, galaxy, solar system and be able to predict orbital motion. After exploring the historical context for our current understandings of the universe, our galaxy, our solar system, and space exploration, students will explore how technology can be leveraged to understand how the earth is changing. Data from these satellites and spectroscopes can be used to identify and propose solutions for increases in greenhouse gas emissions.	
Recommended Pacing	
30 Days	
New Jersey Student Learning Standards for Astronomy	
CPI #	**Cumulative Progress Indicator (CPI)**
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-PS2-4	**Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.***[Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.] [Assessment Boundary: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.]*
MS-ESS3-5.	**Ask questions to clarify evidence of the factors that have caused climate change over the past century.** *[Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of*

	global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
9.4.8.CI.2	Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3)
9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
9.4.8.DC.1	Analyze the resource citations in online materials for proper use.
9.4.8.DC.2	Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8).
9.4.8.DC.8	Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).
9.4.8.GCA.1	Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.1	Critically curate multiple resources to assess the credibility of sources when searching for information
9.4.8.IML.5	Analyze and interpret local or public data sets to summarize and effectively communicate the data
9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).
9.4.8.IML.8	Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b).
9.4.8.TL.1	Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
9.4.8.TL.6	Collaborate to develop and publish work that provides perspectives on a real-world problem.
New Jersey Student Learning Standards for Computer Science and Design Thinking	
CPI #	**Cumulative Progress Indicator (CPI)**

8.1.2.DA.1:	Collect and present data, including climate change data, in various visual formats.
8.1.2.DA.3:	Identify and describe patterns in data visualizations.
8.1.2.DA.4:	Make predictions based on data using charts or graphs.
8.1.5.DA.1:	Collect, organize, and display data in order to highlight relationships or support a claim.
8.1.5.DA.4:	Organize and present climate change data visually to highlight relationships or support a claim.
8.1.5.DA.5:	Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
8.2.5.ED.2:	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
Interdisciplinary Standards (Mathematics and Social Studies)	
CPI #	**Cumulative Progress Indicator (CPI)**
Math MP.2	Reason abstractly and quantitatively.
Math MP.4	Model with mathematics
Math 6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
Math 7.RP.A.2	Recognize and represent proportional relationships between quantities.
Math 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.
Math 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.
U.S. History 6.1	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.
U.S History 6.3	Active Citizenship in the 21st Century: All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.

Instructional Focus

Unit Enduring Understandings

- The universe is made up of many billions of galaxies, each consisting of billions of stars and orbiting these stars are other celestial bodies.
- Gravity is the force that organizes the universe and causes objects to move in a regular and predictable motion.
- The Sun is a star, and shares its characteristics with other stars. It is the source of all energy on earth.
- The earth, sun and moon work as a system that produces seasons, tides, moon phases and day/night. This system also influences climate and weather patterns.
- The properties of the bodies in the solar system reveal information about its early history.
- Humans create waste and debris that impacts not only the earth, but the space around the earth.**(MS-ESS3-5)**
- Satellites can be used to collect images that can show us how the earth has changed over time; specifically, how rapidly the earth is changing based on human activity. (**MS-ESS1-3, MS-ESS3-5)**

Unit Essential Questions

- What celestial bodies are present in the Universe and what are their scale relationships?
- What is gravity's role in the universe and its smaller components?
- How and why do stars, such as our Sun, produce energy?
- How do the earth, moon, and sun operate as a system?
- How does the position, motion and tilt of the Earth, relative to the Sun, produce seasons and night/day?

- How can technology help us understand the history of the universe and what is yet to be discovered?
- How can technology help us understand how the earth is changing, and how to prevent negative change? **(MS-ESS3-5)**

Evidence of Learning (include sample assessments in each corresponding check box row)

☑ **Formative Assessment**

- **QFT:** Phenomena could include these examples**; MS-ESS1-1, MS-ESS1-2, MS-ESS1-3, MS-ESS3-5, MS-PS2-4**
- **Lunar Calendars: (MS-ESS1-1)**
- **Interpreting Local (US) and Global Temperature Maps and Graphs: (MS-ESS1-1) (MS-ESS3-5)**
- **Space Junk: (MS-ESS3-5)**

☑ **Summative Assessment**

- **Solar System Survival: (MS-ESS1-3)**
- **Earth, Moon, Sun Phenomenon-Based Models and CERs:**
  - **(MS-ESS1-1, MS-ESS1-2, and MS-ESS1-3)**

☑ **Alternative Assessment:** Assessments will be differentiated in various ways based on the needs of the students. Differentiation could be in…

- Content (texts, phenomena, graphs, data tables, vocabulary, etc.)
- Process (scaffolding, guiding questions, small group instruction, etc.)
- Product (individual components, student choice in modality such as video, skit, etc)

☑ **Benchmark:**

- **Earth, Moon, Sun Phenomenon-Based Models and CERs: (MS-ESS1-1, MS-ESS1-2, and MS-ESS1-3)**

Assessment Statement for Science Curriculum

The assessment plan includes teacher-designed formative and summative assessments, including common assessments, self-assessments, and performance tasks aligned with the NJSLS-S and the NJSLS-S for Climate Change. During each common, formative, and summative assessment, teachers will provide alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative assessments are individualized for the needs of all students. Accommodations

Resources

Core Text:
Phenomena
https://thewonderofscience.com/
Suggested Resources:
Videos and Websites for Content/Simulations:
Physics of the Universe
NASA
Lunar Phase Simulator
Brief History of Rockets
NASA: ISS Helps to Monitor Climate Change
NASA Solar System Exploration: Mars Resources
Satellites Orbiting the Earth Leolabs
Stuffinspace
Stellarium -Web
Websites for Lesson Planning:
NGSS@NSTA Middle School Space Systems
Technology based lessons:
Gizmos, PhET Simulator: Gravity and Orbits, GoFormative use for Assessments