TOMS RIVER REGIONAL SCHOOLS

Intermediate Science Department

8th Grade

Date Created: May 2021
Board Approval: August 2022
Revised: July 2022

Philosophy, Mission and Vision

Philosophy:

Our philosophy includes the following:

1. To provide a safe and encouraging learning environment for all students that is aligned to the NJDOE Standards for Science Education
2. To prepare students for a successful and positive high school experience
3. To create opportunities for discussion about future career choices and goals
4. To promote, encourage and develop students' critical thinking and problem solving skills to enable future success in a technologically advanced world
5. To instill in our students the concept that Science surrounds us everywhere and in everything we see, feel, hear, smell, touch and do.
6. To encourage curiosity about the world we live in, our planet and its solar system, our natural resources and how to protect them and recycle, our varied habitats and the creatures living in each, and, most importantly, how to think "like a scientist" and formulate conclusions based on factual information gathered

Mission: to provide a strong academic foundation in Science and to challenge students to think critically as they explore essential questions and topics and connect them to their own lives and the real world around them.

Vision: to promote independent thinking and encourage students to become lifelong learners who are curious about the world around them and who can connect their experiences with STEM (Science, Technology, Engineering and Math) and Project-Based Learning to be successful and productive members of a digital and global society.

Course description and/or program overview: Students will be immersed in various scientific topics, including: Engineering & Design, Structure & the Properties of Matter, Atoms & Chemical Reactions, Diversity of Life, and Relationships Within Ecosystems. Students will be introduced to 21 st century skills including: critical thinking, creativity, collaboration, communication, information literacy, media literacy, technology literacy, leadership, productivity, social skills, and flexibility.

UNITS	PACING GUIDE
Introduction to Engineering and Design (MP1)	5 days
Matter and Its Interactions - Structure and Properties of Matter (MP1)	40 days
Matter and Its Interactions - Atoms and Chemical Reactions (MP2)	45 days
Heredity: Inheritance and Variation of Traits (MP3)	23 days
Biological Evolution: Unity and Diversity (MP3/4)	22 days
Ecosystems: Interactions, Energy and Dynamics (MP4)	45 days

The sequence of units is recommended based on the NJ Student Learning Standards.

Engineering and Design (5 Days)

Unit Summary:

Engineering design promotes vital problem solving skills through project-based learning, while strengthening critical thinking skills. Engineering design-aligned curricula help develop students' engineering habits of mind and design thinking by tying together multiple disciplines, and students working in teams to solve real-life problems.

Enduring Understandings:

The Engineering Design Process (EDP) is a method that is used to solve technological challenges to change and improve products for the way we live.

- 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.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.
- 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.
- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
- Models of all kinds are important for testing solutions.
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

Essential Questions:

- Why do engineers and designers strive to improve products used in our daily lives?
- Why do we use the engineering design process to solve design challenges?
- How can the engineering design process benefit us in solving problems in our daily lives?

NJSLS-Science

- 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.

Interdisciplinary Connections

Other Cross-Curricular Opportunities

Opportunities for SEL

Connections to NJSLS - English Language Arts:

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-LS3-1), (MS-LS3-2)
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 scier or technical context relevant to grades 6-8 tests and topics. (MS-LS3-1), (MS-LS3-2)
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (in a flowchart, diagram, model, graph, or table). (MS-LS3-1), (MS-LS3-2)
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add intere (MS-LS3-1), (MS-LS3-2)

Connections to NJSLS - Mathematics

MP.4	Model with mathematics (MS-LS3-2)
6.SP.B.5	Summarize numerical data sets in relation to their context (MS-LS3-2)

21st Century Life and Careers	Technology
21st Century Life and Careers Awareness **9.2.8.B.1** Research careers within the 16 Career Clusters® and determine attributes of career success. **9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career. *Career Ready Practices* **CRP1**. Act as a responsible and contributing citizen and employee. **CRP2**. Apply appropriate academic and technical skills. **CRP4**. Communicate clearly and effectively and with reason. **CRP5**. Consider the environmental, social and economic impacts of decisions. **CRP6**. Demonstrate creativity and innovation. **CRP7.** Employ valid and reliable research strategies. **CRP8**. Utilize critical thinking to make sense of problems and persevere in solving them. **CRP9**. Model integrity, ethical leadership and effective management. **CRP10**. Plan education and career paths aligned to personal goals. **CRP11.** Use technology to enhance productivity. **CRP12.** Work productively in teams while using cultural global competence.	Educational Technology **8.1.A** Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems, and operations. **8.1.B** Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology. **8.1.C** Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. **8.1.D** Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. **8.1.E** Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information. **8.1.F** Critical Thinking, problem-solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

Unit Objectives:

- Relate that engineers create things to benefit society.
- List some of the components of the engineering design process.
- Compare and contrast the scientific method and the engineering design process.
- Explain why brainstorming is important to engineering design.

Skills:

- Asking Questions and Defining Problems
- Developing and Using Models
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data
- Using Mathematics and Computational Thinking
- Constructing Explanations and Designing Solutions

- Engaging in Argument from Evidence
- Obtaining, Evaluating and Communicating Information

Student Learning	
Core Instructional Materials and Resources	**Supplemental Instructional Materials and Resources**
● Textbook - Savvas Elevate Science ● Laboratory manuals and equipment ● Science Websites	● *https://www.teachengineering.org/ TeachEngineering curriculum provides innovative resources and ideas for teachers using NGSS.* ● *http://tryengineering.org/lesson-plans TryEngineering offers a variety of lesson plans that align with education standards to allow teachers and students to apply engineering principles in the classroom.* ● *https://www.nsf.gov/news/classroom/engineering.jsp NSDL is the National Science Foundation's online library of resources for science, technology, engineering, and mathematics education.* ● *http://pbskids.org/designsquad/parentseducators/index.html The goal of Design Squad is to give kids a stronger understanding of the design process, and the connection between engineering and the things we all use in everyday life. The DESIGN SQUAD NATION website equips kids with science and math skills, inspires them, and lays the foundation they need to participate in engineering activities later in life.* ● *http://teachers.egfi-k12.org/category/lessons/grades-6-8-lessons/ eGFI is proudly brought to you by the American Society for Engineering Education (ASEE). We are committed to promoting and enhancing efforts to improve K-12 STEM and engineering education.* ● *http://www.sciencebuddies.org/science-fair-projects/teacher_resources.shtml#science activities Each activity comes with student instructions, and a facilitator guide with just enough information to help anyone lead a good discussion on the science behind the activity.*

	● *Generation Genius Each lesson comes with student instructions, and a facilitator guide with just enough information to help anyone lead a good discussion on the science behind the activity, and an assessment.* ● *http://stemcollaborative.org/additionalResources.html a wealth of worthy STEM resources readily available on the web*
Accommodations/Modifications (ELL,Students with IEPs, 504s, Gifted Learners, At Risk) *Each group must be listed separately*	**Assessment** **(All forms must be identified)**
● ELL: ○ Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ○ Audio books, movies, and other digital media in lieu of print versions ○ Native language texts and native language to English dictionary ● Special Education: ○ Modified assignments (ex: fewer problems per page) ○ Response to Intervention (RTI) (www.help4teachers.com) ○ Oral Instructions ○ Record lessons instead of taking notes ○ Outlines of lessons ○ Study Guides with answers ○ Word processor to type notes ○ Frequent breaks ○ Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● 504:	Formative: ● Homework ● Class participation ● Lab Reports ● Graphic Organizers ● Reflection Questions Summative: ● Presentations ● Writing assignments Benchmark: ● New Jersey Student Learning Assessment Science (NJSLA) ● End of Unit Assessment ● Unit Test ● Performance Assessments Alternate: ● Oral Presentations ● Virtual Labs/Activities ● Video Recording

○ Utilize graphic organizers to help provide a purpose for reading and increase comprehension ○ Assign peer tutor ○ Provide clear and specific directions ○ Provide class notes ahead of time to allow students to preview material and increase comprehension ○ Provide extended time ○ Simplify written and verbal instructions ● Gifted and Talented: ○ Peer Tutoring ○ Cooperative Learning Groups ○ Differentiated Instruction ○ Use project-based science learning to connect science with observable phenomena. ○ Structure the learning around explaining or solving a social or community-based issue. ● Students at Risk of School Failure: ○ Extended Time ○ Flexible Grouping ○ Small Group Instruction ○ Peer Buddies ○ Tiered Activities ○ Manipulatives ○ Graphic Organizers	

Matter and Its Interactions - Structure and Properties of Matter (40 Days)

Unit Summary:

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

Enduring Understandings:

- substances are made from different types of atoms, which combine with one another in various ways.
- atoms form molecules that range in size from two to thousands of atoms.
- solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).
- each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
- substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.
- 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.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
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- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
- Models of all kinds are important for testing solutions.
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

Essential Questions:

- How can particles combine to produce a substance with different properties?
- How does thermal energy affect particles?
- What causes matter to change from one state to another?
- How can we observe, measure, and use matter?

NJSLS-Science

- MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.
- MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
- MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
- MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
- MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
- MS-ETS1-1. 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.
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Interdisciplinary Connections
Other Cross-Curricular Opportunities
Opportunities for SEL

Common Core State Standards Connections:
ELA/Literacy -

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.*(MS-PS1-2)*,(MS-PS1-3)
RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). *(MS-PS1-1)*,(MS-PS1-2),*(MS-PS1-4),(MS-PS1-5)*
WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS1-6)
WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-PS1-3)
Mathematics -	
MP.2	Reason abstractly and quantitatively. (MS-PS1-1),(MS-PS1-2),(MS-PS1-5)
MP.4	Model with mathematics. *(MS-PS1-1)*,(MS-PS1-5)
6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems. *(MS-PS1-1),(MS-PS1-2)*,(MS-PS1-5)
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-PS1-4)
8.EE.A.3	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *(MS-PS1-1)*
6.SP.B.4	Display numerical data in plots on a number line, including dot plots, histograms, and box plots. *(MS-PS1-2)*
6.SP.B.5	Summarize numerical data sets in relation to their context. (MS-PS1-2)

21st Century Life and Careers

21st Century Life and Careers Awareness

9.2.8.B.1 Research careers within the 16 Career Clusters® and determine attributes of career success.

9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Career Ready Practices

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason.

Technology

Interdependence of Science, Engineering, and Technology

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3)

Influence of Science, Engineering and Technology on Society and the Natural World

- The uses of technologies and any limitation on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)

CRP5. Consider the environmental, social and economic impacts of decisions. **CRP6**. Demonstrate creativity and innovation. **CRP7.** Employ valid and reliable research strategies. **CRP8**. Utilize critical thinking to make sense of problems and persevere in solving them. **CRP9**. Model integrity, ethical leadership and effective management. **CRP10**. Plan education and career paths aligned to personal goals. **CRP11.** Use technology to enhance productivity. **CRP12.** Work productively in teams while using cultural global competence.	

Unit Objectives:

- SWBAT construct and use models to explain and describe what makes up matter
- SWBAT use visual examples to describe the properties of matter
- SWBAT describe/cite examples of chemical and physical properties of matter
- SWBAT cite evidence to classify different types of matter
- SWBAT cite evidence to classify homogeneous and heterogeneous mixtures
- SWBAT use evidence to identify and describe how mass compares to weight
- SWBAT analyze data to identify and calculate density as a function of mass and volume
- SWBAT to use reasoning and data to determine how matter is conserved during a physical and a chemical change
- SWBAT to use reasoning and data to determine how thermal energy is transformed during a chemical change
- SWBAT write/explain the difference between physical and a chemical change
- SWBAT write/explain how changes in matter are related to changes in energy
- SWBAT describe and explain similarities and differences between solids, liquids, and gases
- SWBAT describe and explain similarities and differences between high-viscosity liquids and low-viscosity liquids
- SWBAT describe and explain the relationship between particle motion and the state of matter
- SWBAT develop and use models to demonstrate how arrangement and movement of particles compare in solids, liquids and gases
- SWBAT describe cause-and-effect relationships related to the role thermal energy plays in particle motion
- SWBAT describe cause-and-effect relationships related to the role thermal energy plants in changes of state
- SWBAT use text information to explain how pressure affects a change of state from a liquid to a gas
- SWBAT use models to describe what happens to particles of matter during changes of state between solids, liquids, and gases
- SWBAT demonstrate overarching concepts between the relationships of temperature and volume, and pressure and volume in gases

Skills:

- Students will be able to…
    - develop models to describe the atomic composition of simple molecules and extended structures
    - 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
    - demonstrate proficiency in developing and using models, and obtaining, evaluating, and communicating information
    - students use these scientific and engineering practices to demonstrate understanding of the core ideas
    - gather and make sense of information to describe that synthetic materials come from natural resources and impact
    - identify unknown substances based on data regarding their physical and chemical properties
    - predict the physical and chemical properties of elements based on their positions on the Periodic Table
    - provide a molecular level account to explain states of matter and changes between states
    - use these scientific and engineering practices to demonstrate understanding of the core ideas

<table>
<tr><th colspan="2">Student Learning</th></tr>
<tr><th>Core Instructional Materials and Resources</th><th>Supplemental Instructional Materials and Resources</th></tr>
<tr><td>● Elevate Science Textbook - Structure and Properties of Matter Student Hard Copy Work Text
● Laboratory Tools</td><td>https://www.savvasrealize.com/index.html#/
● Lesson Checks
● Math Toolbox Activities
● Connect It questions
● Review And Assess Activities
● Virtual Labs

Edulastic
EdPuzzle
JamBoard
Flipgrid
Padlet
Quizlet
Quizizz
Applied Digital Skills
Parlay Ideas
Seesaw
Generation Genius</td></tr>
<tr><td>Accommodations/Modifications
(ELL,Students with IEPs, 504s, Gifted Learners, At Risk)
Each group must be listed separately</td><td>Assessment
(All forms must be identified)</td></tr>
</table>

● ELL: ○ Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ○ Audio books, movies, and other digital media in lieu of print versions ○ Native language texts and native language to English dictionary ● Special Education: ○ Modified assignments (ex: fewer problems per page) ○ Response to Intervention (RTI) (www.help4teachers.com) ○ Oral Instructions ○ Record lessons instead of taking notes ○ Outlines of lessons ○ Study Guides with answers ○ Word processor to type notes ○ Frequent breaks ○ Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● 504: ○ Utilize graphic organizers to help provide a purpose for reading and increase comprehension ○ Assign peer tutor ○ Provide clear and specific directions ○ Provide class notes ahead of time to allow students to preview material and increase comprehension ○ Provide extended time ○ Simplify written and verbal instructions ● Gifted and Talented:	Formative: ● Homework ● Class participation ● Lab Reports ● Graphic Organizers ● Reflection Questions Summative: ● Presentations ● Writing assignments ● Chapter/Unit Test ● Unit Projects ● Writing Assignments Benchmark: ● New Jersey Student Learning Assessment Science (NJSLA) ● End of Unit Assessment ● Unit Test ● Performance Assessments Alternate: ● Oral Presentations ● Virtual Labs/Activities ● Video Recording

○ Peer Tutoring ○ Cooperative Learning Groups ○ Differentiated Instruction ○ Use project-based science learning to connect science with observable phenomena. ○ Structure the learning around explaining or solving a social or community-based issue. ● Students at Risk of School Failure: ○ Extended Time ○ Flexible Grouping ○ Small Group Instruction ○ Peer Buddies ○ Tiered Activities ○ Manipulatives ○ Graphic Organizers	

Matter and Its Interactions - Atoms and Chemical Reactions (45 Days)

Unit Summary:

Students understand what occurs at the atomic and molecular scale during chemical reactions. Students provide molecular level accounts to explain that chemical reactions involve regrouping of atoms to form new substances, and that atoms rearrange during chemical reactions. Students are also able to apply an understanding of the design and the process of optimization in engineering to chemical reaction systems. The crosscutting concepts of patterns and energy and matter are called out as organizing concepts for these disciplinary core ideas. In these performance expectations, students are expected to demonstrate proficiency in developing and using models, analyzing, and interpreting data, and designing solutions. Students use these scientific and engineering practices to demonstrate understanding of the core ideas.

Enduring Understandings:

Students will understand that…

- substances are made from different types of atoms, which combine with one another in various ways. there is an atomic and molecular scale and what occurs at each level.
- each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
- a solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
- 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.
- although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process that is, some of the characteristics may be incorporated into the new design.
- what occurs at the atomic and molecular scale during chemical reactions.
- the crosscutting concepts of patterns and energy and matter are called out as organizing concepts for these disciplinary core ideas.
- substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.
- the total number of each type of atom is conserved, and thus the mass does not change.
- some chemical reactions release energy, others store energy.
- a solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
- 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.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.
- 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.
- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
- Models of all kinds are important for testing solutions.
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

Essential Questions:

- What happens when new materials are formed?
- What stays the same and what changes?
- How do atoms combine to form extended structures?
- How can you determine when a chemical reaction has occurred?

NJSLS-Science

- MS-PS1-1 Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.
- *MS-PS1-2* Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- MS-PS1-3 Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.
- MS-PS1-4 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.
- MS-PS1-5 Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
- MS-PS1-6 Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
- MS-ETS1-1. 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.

Interdisciplinary Connections

Other Cross-Curricular Opportunities

Opportunities for SEL

Common Core State Standards Connections:

ELA/Literacy -

RI.5.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(5-PS1-1)*
W.5.7	Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. *(5-PS1-2),(5-PS1-3),*(5-PS1-4)
W.5.8	Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. *(5-PS1-2),(5-PS1-3),*(5-PS1-4)
W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research. *(5-PS1-2),(5-PS1-3),(5-PS1-4)*

Mathematics -

MP.2	Reason abstractly and quantitatively. *(5-PS1-1)*,(5-PS1-2),(5-PS1-3)
MP.4	Model with mathematics. *(5-PS1-1)*,(5-PS1-2),(5-PS1-3)
MP.5	Use appropriate tools strategically. (5-PS1-2),(5-PS1-3)
5.NBT.A.1	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. *(5-PS1-1)*
5.NF.B.7	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. *(5-PS1-1)*
5.MD.A.1	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. *(5-PS1-2)*
5.MD.C.3	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. *(5-PS1-1)*
5.MD.C.4	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. *(5-PS1-1)*

21st Century Life and Careers	Technology
21st Century Life and Careers Awareness **9.2.8.B.1** Research careers within the 16 Career Clusters® and determine attributes of career success. **9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career. *Career Ready Practices* **CRP1**. Act as a responsible and contributing citizen and employee. **CRP2**. Apply appropriate academic and technical skills. **CRP4**. Communicate clearly and effectively and with reason. **CRP5**. Consider the environmental, social and economic impacts of decisions. **CRP6**. Demonstrate creativity and innovation. **CRP7.** Employ valid and reliable research strategies. **CRP8**. Utilize critical thinking to make sense of problems and persevere in solving them. **CRP9**. Model integrity, ethical leadership and effective management. **CRP10**. Plan education and career paths aligned to personal goals. **CRP11.** Use technology to enhance productivity. **CRP12.** Work productively in teams while using cultural global competence.	**Interdependence of Science, Engineering, and Technology** ● Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3) **Influence of Science, Engineering and Technology on Society and the Natural World** ● The uses of technologies and any limitation on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)

Unit Objectives:

- SWBAT identify and describe the properties of electrons, protons and neutrons
- SWBAT describe the development of atomic theory
- SWBAT cite evidence that supports the modern model of the atom
- SWBAT identify and describe the organization used to create the periodic table
- SWBAT describe the development of the periodic table
- SWBAT interpret and use the periodic table for locating important information pertaining to the elements
- SWBAT interpret and use the periodic table to describe the elements
- SWBAT cite evidence and interpret data to explain the role of valence electrons in the bonding of atoms
- SWBAT cite evidence and interpret data to describe how the properties of atoms are affected when atoms bond together
- SWBAT cite evidence and interpret data to compare the properties of metals and nonmetals
- SWBAT develop and use models to describe and compare the properties of atoms
- SWBAT develop and use models to explain the role of valence electrons in the structure and function of atoms
- SWBAT recognize that a finite number of elements exists

- SWBAT recognize that atoms combine to produce compounds that make up all living and nonliving things
- SWBAT identify basic examples of atoms
- SWBAT compare and classify properties of various compounds including acids, bases, and salts
- SWBAT analyzes and interprets data about the properties of substances to determine if a change in matter is physical or chemical.
- SWBAT identify and describe the factors that affect the rate at which a chemical reaction occur
- SWBAT interpret and develop models to identify components of a chemical reaction including products, reactants and number of atoms and molecules
- SWBAT use chemical equations to model mass conservation during a chemical change

Skills:

Students will be able to…

- analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred
- 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
- undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes
- design qualitative investigations to differentiate between physical and chemical changes in matter
- provide molecular level accounts to explain that chemical reactions involve regrouping of atoms to form new substances, and that atoms rearrange during chemical reactions
- apply an understanding of the design and the process of optimization in engineering to chemical reaction systems. demonstrate proficiency in developing and using models, analyzing and interpreting data, and designing solutions

Student Learning	
Core Instructional Materials and Resources	**Supplemental Instructional Materials and Resources**
• Elevate Science Textbook - Atoms and Chemical Reactions Student Hard Copy Work Text • Laboratory Tools	https://www.savvasrealize.com/index.html#/ • Lesson Checks • *Math Toolbox* Activities • *Connect It* questions • *Review And Assess* Activities • Virtual Labs

	Edulastic EdPuzzle JamBoard Flipgrid Padlet Quizlet Quizizz Applied Digital Skills Parlay Ideas Seesaw Generation Genius
Accommodations/Modifications (ELL,Students with IEPs, 504s, Gifted Learners, At Risk) *Each group must be listed separately*	**Assessment** **(All forms must be identified)**
● ELL: ○ Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ○ Audio books, movies, and other digital media in lieu of print versions ○ Native language texts and native language to English dictionary ● Special Education: ○ Modified assignments (ex: fewer problems per page) ○ Response to Intervention (RTI) (www.help4teachers.com) ○ Oral Instructions ○ Record lessons instead of taking notes ○ Outlines of lessons ○ Study Guides with answers ○ Word processor to type notes ○ Frequent breaks ○ Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs,	Formative: ● Homework ● Class participation ● Lab Reports ● Graphic Organizers ● Reflection Questions Summative: ● Presentations ● Writing assignments ● Chapter/Unit Test ● Unit Projects ● Writing Assignments Benchmark: ● New Jersey Student Learning Assessment Science (NJSLA) ● End of Unit Assessment ● Unit Test ● Performance Assessments Alternate: ● Oral Presentations ● Virtual Labs/Activities ● Video Recording

charts, data tables, multimedia, modeling). ● 504: ○ Utilize graphic organizers to help provide a purpose for reading and increase comprehension ○ Assign peer tutor ○ Provide clear and specific directions ○ Provide class notes ahead of time to allow students to preview material and increase comprehension ○ Provide extended time ○ Simplify written and verbal instructions ● Gifted and Talented: ○ Peer Tutoring ○ Cooperative Learning Groups ○ Differentiated Instruction ○ Use project-based science learning to connect science with observable phenomena. ○ Structure the learning around explaining or solving a social or community-based issue. ● Students at Risk of School Failure: ○ Extended Time ○ Flexible Grouping ○ Small Group Instruction ○ Peer Buddies ○ Tiered Activities ○ Manipulatives ○ Graphic Organizers	

Heredity: Inheritance and Variation of Traits (23 Days)

Unit Summary:

Students understand how the environment and genetic factors determine the growth of an individual organism. They also demonstrate understanding of the genetic implications for sexual and asexual reproduction. Students develop evidence to support their understanding of the structures and behaviors that increase the likelihood of successful reproduction by organisms. They have a beginning understanding of the ways humans can select specific traits, the role of technology, genetic modification, and the nature of ethical responsibilities related to selective breeding. At the end of the unit, students can explain how selected structures, functions, and behaviors of organisms change in predictable ways as they progress from birth to old age.

Enduring Understandings:

Students will understand that…

- genetics and the environment both affects an organism's growth
- the genetic implications for sexual and asexual reproduction.
- There are structures and behaviors that increase the likelihood of successful reproduction by organisms.
- the ways humans can select for specific traits, the role of technology, genetic modification, and the nature of ethical responsibilities related to selective breeding (Please note that students are only beginning to understand this concept.)
- how selected structures, functions, and behaviors of organisms change in predictable ways as they progress from birth to old age.
- 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.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.

- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.
- 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.
- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
- Models of all kinds are important for testing solutions.
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

Essential Questions:

- How do offspring receive traits from their parents?

NJSLS-Science

- MS-LS3-1 Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.
- MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
- 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.

Interdisciplinary Connections
Other Cross-Curricular Opportunities
Opportunities for SEL

Connections to NJSLS - English Language Arts:

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. *(MS-LS4-1)*,(MS-LS4-2),*(MS-LS4-3),(MS-LS4-4)*
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS4-1),(MS-LS4-3)
RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. *(MS-LS4-3),(MS-LS4-4)*
WHST.6-8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-2),(MS-LS4-4)
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2),(MS-LS4-4)
SL.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. *(MS-LS4-2),(MS-LS4-4)*
SL.8.4	Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. *(MS-LS4-2),(MS-LS4-4)*

Connections to NJSLS - Mathematics

MP.4	Model with mathematics. (MS-LS4-6)
6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *(MS-LS4-4),(MS-LS4-6)*
6.SP.B.5	Summarize numerical data sets in relation to their context. *(MS-LS4-4),(MS-LS4-6)*
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-LS4-1),(MS-LS4-2)*
7.RP.A.2	Recognize and represent proportional relationships between quantities. *(MS-LS4-4),(MS-LS4-6)*

21st Century Life and Careers

9.2.8.B.1 Research careers within the 16 Career Clusters® and determine attributes of career success.
9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Career Ready Practices

CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP10. Plan education and career paths aligned to personal goals.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.

Technology

8.1.A Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems, and operations.
8.1.B Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
8.1.C Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
8.1.D Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
8.1.E Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
8.1.F Critical Thinking, problem-solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

21st Century Life and Careers Awareness

9.2.8.B.1 Research careers within the 16 Career Clusters® and determine attributes of career success.
9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Career Ready Practices

CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP10. Plan education and career paths aligned to personal goals.

CRP11. Use technology to enhance productivity. **CRP12.** Work productively in teams while using cultural global competence.	

Unit Objectives:

- Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
- Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation
- Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Skills:

- use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
- construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
- develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
- gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
- create and read a pedigree
- create and read a punnett square

Student Learning	
Core Instructional Materials and Resources	**Supplemental Instructional Materials and**

	Resources
• Elevate Science Textbook - Diversity of Life Student Hard Copy Work Text • Laboratory Tools	https://www.savvasrealize.com/index.html#/ • Lesson Checks • *Math Toolbox* Activities • *Connect It* questions • *Review And Assess* Activities • Virtual Labs Edulastic EdPuzzle JamBoard Flipgrid Padlet Quizlet Quizizz Applied Digital Skills Parlay Ideas Seesaw Generation Genius
Accommodations/Modifications (ELL,Students with IEPs, 504s, Gifted Learners, At Risk) *Each group must be listed separately*	**Assessment** **(All forms must be identified)**
• ELL: ○ Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ○ Audio books, movies, and other digital media in lieu of print versions ○ Native language texts and native language to English dictionary • Special Education: ○ Modified assignments (ex: fewer problems per page) ○ Response to Intervention (RTI) (www.help4teachers.com) ○ Oral Instructions ○ Record lessons instead of taking notes ○ Outlines of lessons ○ Study Guides with answers ○ Word processor to type notes	Formative: • Homework • Class participation • Lab Reports • Graphic Organizers • Reflection Questions Summative: • Presentations • Writing assignments • Chapter/Unit Test • Unit Projects • Writing Assignments Benchmark: • New Jersey Student Learning Assessment Science (NJSLA) • End of Unit Assessment • Unit Test • Performance Assessments Alternate: • Oral Presentations • Virtual Labs/Activities

○ Frequent breaks ○ Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● 504: ○ Utilize graphic organizers to help provide a purpose for reading and increase comprehension ○ Assign peer tutor ○ Provide clear and specific directions ○ Provide class notes ahead of time to allow students to preview material and increase comprehension ○ Provide extended time ○ Simplify written and verbal instructions ● Gifted and Talented: ○ Peer Tutoring ○ Cooperative Learning Groups ○ Differentiated Instruction ○ Use project-based science learning to connect science with observable phenomena. ○ Structure the learning around explaining or solving a social or community-based issue. ● Students at Risk of School Failure: ○ Extended Time ○ Flexible Grouping ○ Small Group Instruction ○ Peer Buddies ○ Tiered Activities ○ Manipulatives ○ Graphic Organizers	● Video Recording

Unit Summary:

Students will analyze data from fossil records to describe evidence of the history of life on Earth and construct explanations for similarities in organisms. They have a beginning understanding of the role of variation in natural selection and how this leads to speciation. They have a grade appropriate understanding and use of the practices of analyzing graphical displays; using mathematical models; and gathering, reading, and communicating information. The crosscutting concept of cause and effect is central to this topic.

Enduring Understandings:

Students will understand that…

- recognize similarities among organisms that lived at different times in Earth's history
- explaining how species can change over time through adaptation by natural selection
- the role of variation in natural selection and survival
- 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.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.
- 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.
- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
- Models of all kinds are important for testing solutions.
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

Essential Questions:

- How do characteristics change over time?

NJSLS-Science

- MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
- MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
- MS-LS4-3. Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.
- MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- MS-LS4-5. Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.
- MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time
- 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.

Interdisciplinary Connections

Other Cross-Curricular Opportunities

Opportunities for SEL

Connections to NJSLS- English Language Arts:

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-1), (MS-LS2-2), (MS-LS2-4)
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS2-1)
RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5)
RI.8.8	Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS2-4), (MS-LS2-5)
WHST.6-8.1	Write arguments focused on discipline-specific content. (MS-LS2-4)
WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (MS-LS2-2)
WHST.6-8.9	Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-2), (MS-LS2-4)
SL.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. *(MS-LS2-2)*
SL.8.4	Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. *(MS-LS2-2)*
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS2-3)

Connections to NJSLS- Mathematics:

MP.4	Model with mathematics. *(MS-LS2-5)*
6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems. *(MS-LS2-5)*
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-LS2-3)
6.SP.B.5	Summarize numerical data sets in relation to their context. *(MS-LS2-2)*

21st Century Life and Careers	Technology
9.2.8.B.1 Research careers within the 16 Career Clusters® and determine attributes of career success. **9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career. *Career Ready Practices* **CRP1**. Act as a responsible and contributing citizen and employee. **CRP2**. Apply appropriate academic and technical skills. **CRP4**. Communicate clearly and effectively and with reason. **CRP5**. Consider the environmental, social and economic impacts of decisions. **CRP6**. Demonstrate creativity and innovation. **CRP7.** Employ valid and reliable research strategies. **CRP8**. Utilize critical thinking to make sense of problems and persevere in solving them. **CRP9**. Model integrity, ethical leadership and effective management. **CRP10**. Plan education and career paths aligned to personal goals. **CRP11.** Use technology to enhance productivity. **CRP12.** Work productively in teams while using cultural global competence.	**8.1.A** Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems, and operations. **8.1.B** Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology. **8.1.C** Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. **8.1.D** Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. **8.1.E** Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information. **8.1.F** Critical Thinking, problem-solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

Unit Objectives:

- Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem
- Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

Skills:

Students will be able to…

- analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
- apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and organisms found in the fossil record.
- analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify similarities.
- construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
- analyze data from the fossil record to describe evidence of the history of life on Earth and construct explanations for similarities in organisms.
- the use of the practices (grade appropriate) of analyzing graphical displays; using mathematical models; and gathering, reading, and communicating information.

Student Learning	
Core Instructional Materials and Resources	**Supplemental Instructional Materials and Resources**
• Elevate Science Textbook -Relationships within ecosystems Student Hard Copy Work Text • Laboratory Tools	https://www.savvasrealize.com/index.html#/ • Lesson Checks • *Math Toolbox* Activities • *Connect It* questions • *Review And Assess* Activities • Virtual Labs Edulastic EdPuzzle JamBoard Flipgrid Padlet Quizlet Quizizz Applied Digital Skills Parlay Ideas Seesaw

	Generation Genius
Accommodations/Modifications (ELL,Students with IEPs, 504s, Gifted Learners, At Risk) *Each group must be listed separately*	**Assessment** **(All forms must be identified)**
● ELL: ○ Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ○ Audio books, movies, and other digital media in lieu of print versions ○ Native language texts and native language to English dictionary ● Special Education: ○ Modified assignments (ex: fewer problems per page) ○ Response to Intervention (RTI) (www.help4teachers.com) ○ Oral Instructions ○ Record lessons instead of taking notes ○ Outlines of lessons ○ Study Guides with answers ○ Word processor to type notes ○ Frequent breaks ○ Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● 504: ○ Utilize graphic organizers to help provide a purpose for reading and increase comprehension ○ Assign peer tutor ○ Provide clear and specific directions ○ Provide class notes ahead of time	Formative: ● Homework ● Class participation ● Lab Reports ● Graphic Organizers ● Reflection Questions Summative: ● Presentations ● Writing assignments ● Chapter/Unit Test ● Unit Projects ● Writing Assignments Benchmark: ● New Jersey Student Learning Assessment Science (NJSLA) ● End of Unit Assessment ● Unit Test ● Performance Assessments Alternate: ● Oral Presentations ● Virtual Labs/Activities ● Video Recording

to allow students to preview material and increase comprehension ○ Provide extended time ○ Simplify written and verbal instructions ● Gifted and Talented: ○ Peer Tutoring ○ Cooperative Learning Groups ○ Differentiated Instruction ○ Use project-based science learning to connect science with observable phenomena. ○ Structure the learning around explaining or solving a social or community-based issue. ● Students at Risk of School Failure: ○ Extended Time ○ Flexible Grouping ○ Small Group Instruction ○ Peer Buddies ○ Tiered Activities ○ Manipulatives ○ Graphic Organizers	

Ecosystems: Interactions, Energy and Dynamics (45 Days)

Unit Summary: Students construct explanations for the interactions in ecosystems and the scientific, economic, political, and social justifications used in making decisions about maintaining biodiversity in ecosystems. Students use models, construct evidence based explanations, and use argumentation from evidence. Students understand that organisms and populations of organisms are dependent on their environmental interactions both with other organisms and with

nonliving factors. They also understand the limits of resources influence the growth of organisms and populations, which may result in competition for those limited resources. Crosscutting concepts of matter and energy, systems and system models, and cause and effect are used by students to support understanding the phenomena they study.

Enduring Understandings:

Students will understand that…

- organisms and populations of organisms are dependent on their environmental interactions both with other organisms and with nonliving factors
- the limits of resources influence the growth of organisms and populations, which may result in competition for those limited resources
- crosscutting concepts of matter and energy, systems and system models, and cause and effect are used to support understanding of the phenomena they study
- Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.
- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.
- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.
- Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.

- 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.
- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization and precipitation, as well as downhill flows on land.
- 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.
- 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.

- 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.
- 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.
- 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.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.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.
- 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.
- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
- Models of all kinds are important for testing solutions.
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

Essential Questions:

- How do living and nonliving things affect one another?
- How are matter and energy cycled in an ecosystem?

NJSLS-Science

- MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
- MS-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-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-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.

Interdisciplinary Connections

Other Cross-Curricular Opportunities

Opportunities for SEL

Common Core State Standards Connections:

ELA/Literacy -

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-1),(MS-LS2-2),(MS-LS2-4)
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS2-1)
RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5)
RI.8.8	Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS2-4),(MS-LS2-5)
WHST.6-8.1	Write arguments to support claims with clear reasons and relevant evidence. (MS-LS2-4)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS2-2)

WHST.6-8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-2),(MS-LS2-4)

SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. *(MS-LS2-2)*

SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. *(MS-LS2-2)*

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. *(MS-LS2-3)*

Mathematics -

MP.4 Model with mathematics. *(MS-LS2-5)*

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. *(MS-LS2-5)*

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-LS2-3)*

6.SP.B.5 Summarize numerical data sets in relation to their context. *(MS-LS2-2)*

21st Century Life and Careers

21st Century Life and Careers Awareness

9.2.8.B.1 Research careers within the 16 Career Clusters® and determine attributes of career success.

9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Career Ready Practices

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP9. Model integrity, ethical leadership and effective management.

Technology

8.1.A Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems, and operations.

8.1.B Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.

8.1.C Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

8.1.D Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

8.1.E Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.

8.1.F Critical Thinking, problem-solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

CRP10. Plan education and career paths aligned to personal goals. **CRP11.** Use technology to enhance productivity. **CRP12.** Work productively in teams while using cultural global competence.	

Unit Objectives:

- SWBAT construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- SWBAT construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- SWBAT describe how one population of organisms may affect other plants and/or animals in an ecosystem.
- SWBAT predict the impact of humans altering biotic and abiotic factors have on an ecosystem.
- SWBAT model the effect of positive and negative changes in population size on a symbiotic pairing.
- SWBAT construct explanations for the interactions in ecosystems and the scientific, economic, political, and social justifications used in making decisions about maintaining biodiversity in ecosystems.
- SWBAT use models, construct evidence-based explanations, and use argumentation from evidence.
- SWBAT predict the impact of humans altering biotic and abiotic factors have on an ecosystem.
- SWBAT model the effect of positive and negative changes in population size on a symbiotic pairing.
- SWBAT construct explanations for the interactions in ecosystems and the scientific, economic, political, and social justifications used in making decisions about maintaining biodiversity in ecosystems.
- SWBAT use models, construct evidence-based explanations, and use argumentation from evidence.
- SWBAT identify how climate varies over space and time through both natural and man-made processes.
- Per State Mandated protocol, students will have an opportunity to reflect on the life and careers of scientists that represent persons with disabilities and LBGTQ+.

Skills:

Students will be able to…

- construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

- construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- describe how one population of organisms may affect other plants and/or animals in an ecosystem.
- predict the impact of humans altering biotic and abiotic factors have on an ecosystem.
- model the effect of positive and negative changes in population size on a symbiotic pairing.
- construct explanations for the interactions in ecosystems and the scientific, economic, political, and social justifications used in making decisions about maintaining biodiversity in ecosystems.
- use models, construct evidence-based explanations, and use argumentation from evidence.

Student Learning	
Core Instructional Materials and Resources	**Supplemental Instructional Materials and Resources**
● Elevate Science Textbook - Relationships within ecosystems Student Hard Copy Work Text ● Laboratory Tools	https://www.savvasrealize.com/index.html#/ ● Lesson Checks ● *Math Toolbox* Activities ● *Connect It* questions ● *Review And Assess* Activities ● Virtual Labs Edulastic EdPuzzle JamBoard Flipgrid Padlet Quizlet Quizizz Applied Digital Skills Parlay Ideas Seesaw Generation Genius
Accommodations/Modifications (ELL,Students with IEPs, 504s, Gifted Learners, At Risk) *Each group must be listed separately*	**Assessment** **(All forms must be identified)**
● ELL: ○ Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal	Formative: ● Homework ● Class participation ● Lab Reports ● Graphic Organizers ● Reflection Questions

articles, and biographies). ○ Audio books, movies, and other digital media in lieu of print versions ○ Native language texts and native language to English dictionary ● Special Education: ○ Modified assignments (ex: fewer problems per page) ○ Response to Intervention (RTI) (www.help4teachers.com) ○ Oral Instructions ○ Record lessons instead of taking notes ○ Outlines of lessons ○ Study Guides with answers ○ Word processor to type notes ○ Frequent breaks ○ Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● 504: ○ Utilize graphic organizers to help provide a purpose for reading and increase comprehension ○ Assign peer tutor ○ Provide clear and specific directions ○ Provide class notes ahead of time to allow students to preview material and increase comprehension ○ Provide extended time ○ Simplify written and verbal instructions ● Gifted and Talented: ○ Peer Tutoring ○ Cooperative Learning Groups ○ Differentiated Instruction ○ Use project-based science learning to connect science with observable phenomena. ○ Structure the learning around	Summative: ● Presentations ● Writing assignments ● Chapter/Unit Test ● Unit Projects ● Writing Assignments Benchmark: ● New Jersey Student Learning Assessment Science (NJSLA) ● End of Unit Assessment ● Unit Test ● Performance Assessments Alternate: ● Oral Presentations ● Virtual Labs/Activities ● Video Recording

explaining or solving a social or community-based issue. ● Students at Risk of School Failure: ○ Extended Time ○ Flexible Grouping ○ Small Group Instruction ○ Peer Buddies ○ Tiered Activities ○ Manipulatives ○ Graphic Organizers	