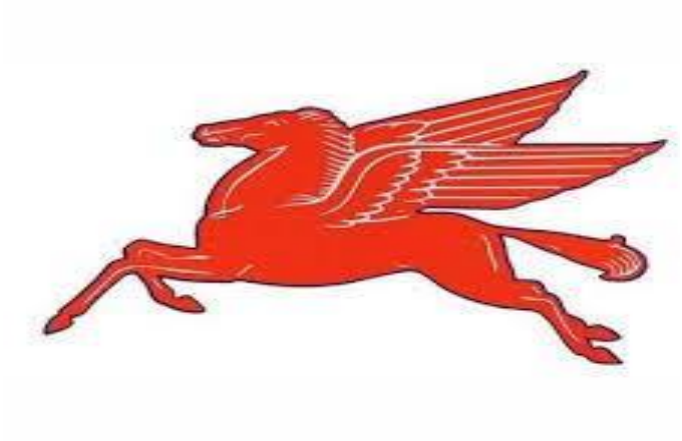
Curriculum Management System

PAULSBORO PUBLIC SCHOOLS



Science Curriculum- Eighth Grade

UPDATED JUNE 2016

For adoption by all regular education programs as specified and for adoption or adaptation by all Special Education Programs in accordance with Board of Education Policy.

Board Approved: September 2016

Table of Contents

Paulsboro Public Schools

Dr. Laurie Bandlow, Superintendent

Board of Education

Mr. Thomas Ridinger, President
Ms. Bonnie Eastlack, Vice President
Mrs. Barbara Dunn
Mr. Marvin E. Hamilton, Sr.
Mr. John Hughes*
Mr. Joseph L. Lisa

Mrs. Lisa Priest
Mrs. Lisa L. Lozada-Shaw
Mrs. Irma R. Stevenson
Mr. James J. Walter

* Greenwich Township Board of Education Representative

District Administration

Dr. Lucia Pollino, Director of Curriculum & Assessment

Ms. Jennifer Johnson, Business Administrator/Board Secretary

Mr. John Giovannitti, Director of Special Services

Mr. Paul Bracciante, Principal, grades Pre-K to 2

Mr. Matthew J. Browne, Principal, grades 3-6

Ms. Mildred Tolbert, Principal, grades 7-8

Mr. Paul Morina, Principal, grades 9-12

Curriculum Writing Team

Mrs. Cheryl Fisher- Biology Teacher/ Middle School Science Teacher

Paulsboro Public Schools

Mission Statement

The mission of the Paulsboro School District is to provide each student the educational opportunities to assist in attaining their full potential in a democratic society. Our instructional programs will take place in a responsive, community based school system that fosters respect among all people. Our expectation is that all students will achieve the New Jersey Core Curriculum Content Standards (NJCCCS) at every grade level.

New Jersey State Department of Education 21st Century College and Career Readiness Standards

The 12 Career Ready Practices

These practices outline the skills that all individuals need to have to truly be adaptable, reflective, and proactive in life and careers. These are researched practices that are essential to career readiness.

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

CRP2. Apply appropriate academic and technical skills.

CRP3. Attend to personal health and financial well-being.

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.

9.1 Personal Financial Literacy -This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

9.2 Career Awareness, Exploration, and Preparation- This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements. http://www.state.nj.us/education/cccs/2014/career/

MODIFICATIONS

Special Education:
Students Hands on activity, cooperative learning, peer tutoring, extended time, reteach in utilizing various methods. Utilize remediation resources which include assessment and intervention, in planning and instruction.

English Language Learners:
Provide hands-on activities and explanations. Use reduced text, so that print is not so dense. Assess comprehension through demonstration or other alternative means (gestures, drawings). Give instructions/directions in writing and orally. Use of translation dictionaries to locate words in the native language.
Use English Learners resources such as study guides, assessments and a visual glossary.

At-Risk Students:
Hands on activities cooperative learning, reteach using various methods. Make use of remediation lessons and quizzes when appropriate.

Gifted and Talented Students:
Utilize Pre-AP Resources such as the pacing, assignment and best practices guide.

SCIENCE UNIT	NJCCS ENGLISH LANGUAGE ARTS STANDARDS	NJCCS MATHEMATICS STANDARDS
Evidence of a Common Ancestry	RST.6-8.1, RST.6-8.7, RST.6-8.9, WHST.6-8.2, WHST.6-8.9, WHST.6-8.2, WHST.6-8.9, SL.8.1, SL.8.4	6.EE.B.6
Selection and Adaptation	RST.6-8.1, RST.6-8.9, WHST.6-8.2, WHST.6-8.8. WHST.6-8.9, SL.8.1, SL.8.4	MP.4, 6.RP.A.1, 6.SP.B.5, 7.RP.A.2
Stability and Change on Earth	RST.6-8.1, RST.6-8.7, WHST.6-8.2, WHST.6-8.9	MP.2, 6.EE.B.6, 7.EE.B.4
Human Impact	RST.6-8.1, RST.6-8.7, RST.6-8.9, WHST.6-8.7, WHST.6-8.8, WHST.6-8.9, SL.8.5	6.EE.B.6, 7.EE.B.4, 6.RP.A.1, 7.RP.A.2, MP.2, 7.EE.3
Relationships and Forms of Energy	RST.6-8.1, RST.6-8.7, WHST.6-8.1, WHST.6-8., SL.8.5	MP.2, 6.RP.A.1, 6.RP.A.2, 7.RP.A.2, 8.EE.A.1, 8.EE.A.2, 8.F.A.3
Thermal Energy	RST.6-8.1, RST.6-8.3, RST.6-8.7, RST.6-8.9, WHST.6-8.7, WHST.6-8.8, WHST.6-8.9, SL.8.5	7.EE.3, 7.SP
The Electromagnetic Spectrum	RST.6-8.1, RST.6-8.2, RST.6-8.9, WHST.6-8.9, SL.8.5	MP.2, MP.4, 6.RP.A.1, 6.RP.A.3, 7.RP.A.2, 8.F.A.3

Scope and Sequence

Quarter 1 – Grade 8

Big Idea: UNIT 1: Evidence of a Common Ancestry

How do we know when an organism (fossil) was alive?

How do we know that birds and dinosaurs are related?

Disciplinary Core Ideas

LS4.A: Evidence of Common Ancestry and Diversity

- The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)
- Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)
- Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)

Big Idea: UNIT 2: Selection and Adaptation

Are Genetically Modified Organisms (GMO) safe to eat?

Disciplinary Core Ideas

LS4.B: Natural Selection

- Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)
- In *artificial* selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed onto offspring. (MS-LS4-5)

LS4.C: Adaptation

- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)

Scope and Sequence

Quarter 2 – Grade 8

Big Idea: Unit 3 - Stability and Change on Earth

Why aren't minerals and groundwater distributed evenly across the world?

Disciplinary Core Ideas

ESS3.A: Natural Resources

- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)

ESS3.B: Natural Hazards

- Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS3-2)

ESS3.C: Human Impacts on Earth Systems

- Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS-ESS3-4)

ESS3.D: Global Climate Change

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

Big Idea: Unit 4 - Human Impact

How do we monitor the health of the environment (our life support system)?

Disciplinary Core Ideas

ESS3.C: Human Impacts on Earth Systems

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

ETS1.A: Defining and Delimiting Engineering Problems

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

ETS1.B: Developing Possible Solutions

A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)

- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)
- Models of all kinds are important for testing solutions. (MS-ETS1-4)

Scope and Sequence

Quarter 3 – Grade 8

Big Idea: Unit 5 - Relationships and Forms of Energy

How can physics explain sports?

Disciplinary Core Ideas

PS3.A: Definitions of Energy

- Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)
- A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2)

PS3.B: Conservation of Energy and Energy Transfer

- When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5)

PS3.C: Relationship Between Energy and Forces

- When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2

Big Idea: Unit 6 - Thermal Energy

How can a standard thermometer be used to tell you how particles are behaving?

Disciplinary Core Ideas

PS3.A: Definitions of Energy

- Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3),(MS-PS3-4)

PS3.B: Conservation of Energy and Energy Transfer

- The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4)
- Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3)

ETS1.A: Defining and Delimiting Engineering Problems

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

ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)

	• Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) • Models of all kinds are important for testing solutions. (MS-ETS1-4) **ETS1.C: Optimizing the Design Solution** • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3) • The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)

Scope and Sequence

Quarter 4 – Grade 8

Big Idea: Unit 7 - The Electromagnetic Spectrum

How do cell phones work?

Disciplinary Core Ideas

PS4.A: Wave Properties

- A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1)
- A sound wave needs a medium through which it is transmitted. (MS-PS4-2)

PS4.B: Electromagnetic Radiation

- When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-2)
- The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (MS-PS4-2)
- A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS4-2)
- However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2)

PS4.C: Information Technologies and Instrumentation

- Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3)

QUARTER 1 – 15 days

Big Idea: Evidence of a Common Ancestry

Standards: NGSS - Life Science

MS-LS4-1

- Analyze and interpret data to determine similarities and differences in findings.
- Science knowledge is based upon logical and conceptual connections between evidence and explanations.
- The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.
- Graphs, charts, and images can be used to identify patterns in data.
- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.

MS-LS4-2

- Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent

GOAL

In this unit of study, students analyze graphical displays and gather evidence from multiple sources in order to develop an understanding of how fossil records and anatomical similarities of the relationships among organisms and species describe biological evolution. Students search for patterns in the evidence to support their understanding of the fossil record and how those patterns show relationships between modern organisms and their common ancestors. The crosscutting concepts of *cause and effect, patterns*, and *structure and function* are called out as organizing concepts for these disciplinary core ideas. Students use the practices of *analyzing graphical displays* and *gathering, reading, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Essential Questions

1. How do we know when an organism (fossil) was alive?
2. How do we know that birds and dinosaurs are related?
3. Other than bones and structures being similar, what other evidence is there that birds and dinosaurs are related?

Assessments

Formative:

- Use graphs, charts, and images to identify patterns within the fossil record.
- Analyze and interpret data within the fossil record to determine similarities and differences in findings.
- Make logical and conceptual connections between evidence in the fossil record and explanations about the existence, diversity, extinction, and change in many life forms throughout the history of life on Earth.
- Apply scientific ideas to construct explanations for evolutionary relationships.
- Apply the patterns in gross anatomical structures among modern organisms

● Patterns can be used to identify cause and effect relationships. **MS-LS4-3** ● Analyze displays of data to identify linear and nonlinear relationships. ● Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. **Career Ready Practices** CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.		and between modern organisms and fossil organisms to construct explanations of evolutionary relationships. ● Apply scientific ideas about evolutionary history to construct an explanation for evolutionary relationships evidenced by similarities or differences in the gross appearance of anatomical structures. ● Use diagrams or pictures to identify patterns in embryological development across multiple species. ● Analyze displays of pictorial data to identify where the embryological development is related linearly and where that linear nature ends. ● Infer general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures. **Summative/Topic Assessment** ● Interactive Science assessments, formal lab sheets, experiments
	Enduring Understanding	**Resources**
	Students will demonstrate grade appropriate proficiency in analyzing and interpreting data, using models,conducting	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum

	investigations, and communicating information.	- NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

QUARTER 1 - 20 days

Big Idea: Selection and Adaptation

Standards: NGSS Life Science

MS-LS4-4

- Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena.
- Natural selection leads to the predominance of certain traits in a population, and the suppression of others.
- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

MS-LS4-5

- Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.
- In *artificial* selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed onto offspring.
- 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.

GOAL

Students construct explanations based on evidence to support fundamental understandings of natural selection and evolution. They will use ideas of genetic variation in a population to make sense of how organisms survive and reproduce, thus passing on the traits of the species. The crosscutting concepts of *patterns* and *structure and function* are called out as organizing concepts that students use to describe biological evolution. Students use the practices of *constructing explanations*, *obtaining, evaluating, and communicating information*, and *using mathematical and computational thinking*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Essential Questions	**Assessments**
1. Are Genetically Modified Organisms (GMO) safe to eat? 2. How can changes to the genetic code increase or decrease an individual's chances of survival? 3. How can the environment affect natural selection?	**Formative:** ● Construct an explanation that includes probability statements regarding variables and proportional reasoning of how genetic variations of traits in a population increase some individuals' probability surviving and reproducing in a specific environment. ● Use probability to describe some cause-and-effect relationships that can be used to explain why some individuals survive and reproduce in a specific environment. ● Explain some causes of natural selection and the effect it has on

● Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. **MS-LS4-6** ● Use mathematical representations to support scientific conclusions and design solutions. ● Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. **Career Ready Practices** CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.		the increase or decrease of specific traits in populations over time. ● Use mathematical representations to support conclusions about how natural selection may lead to increases and decreases of genetic traits in populations over time. ● Gather, read, and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms (artificial selection) from multiple appropriate sources. ● Describe how information from publications about technologies and methods that have changed the way humans influence the inheritance of desired traits in organisms (artificial selection) used are supported or not supported by evidence. ● • Assess the credibility, accuracy, and possible bias of publications and the methods they used when gathering information about technologies that have changed the way humans influence the inheritance of desired traits in organisms (artificial selection). **Summative/Topic Assessment** ● Interactive Science assessments, formal lab sheets**,** experiments
	Enduring Understanding	**Resources**

	Students will demonstrate grade appropriate proficiency in asking questions, designing solutions, engaging in argument from evidence, developing and using models, and designing solutions.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

QUARTER 2 – 30 days
Big Idea: Stability and Change on Earth

Standards: NGSS Earth and Space Science

MS-ESS3-1

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.
- Cause and effect relationships may be used to predict phenomena in natural or designed systems.
- All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.

MS-ESS3-2

- 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.
- Graphs, charts, and images can be used to identify patterns in data.
- The uses of technologies and any limitations on their use are driven by individual or societal

GOAL

Students construct an understanding of the ways that human activities affect Earth's systems. Students use practices to understand the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts on the development of these resources. Students also understand that the distribution of these resources is uneven due to past and current geosciences processes or removal by humans. The crosscutting concepts of *patterns, cause and effect*, and *stability and change* are called out as organizing concepts for these disciplinary core ideas. In this unit of study students are expected to demonstrate proficiency in *asking questions, analyzing and interpreting data, constructing explanations, and designing solutions.* Students are also expected to use these practices to demonstrate understanding of the core ideas.

Essential Questions

1. Why aren't minerals and groundwater distributed evenly across the world?
2. How can we predict and prepare for natural disasters?
3. How might we treat resources if we thought about the Earth as a spaceship on an extended survey of the solar system? (How would astronauts manage their resources?)
4. How can basic chemistry be used to explain the mechanisms that control the global temperature the atmosphere?

Assessments

Formative:

- Construct a scientific explanation based on valid and reliable evidence of how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geosciences processes.
- Obtain evidence from sources, which must include the student's own experiments.
- Construct a scientific explanation based on the assumption that theories and laws that describe the current geosciences process operates today as they did in the past and will continue to do so in the future.

needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. **MS-ESS3-4** ● Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. ● Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. ● Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. **MS-ESS3-5** ● Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. ● Stability might be disturbed either by sudden events or gradual changes that accumulate over time. **Career Ready Practices** CRP5. Consider the environmental, social and		● Analyze and interpret data on natural hazards to determine similarities and differences and to distinguish between correlation and causation. ● Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. ● Ask questions to identify and clarify a variety of evidence for an argument about the factors that have caused the rise in global temperatures over the past century. ● Ask questions to clarify human activities and natural processes that are major factors in the current rise in Earth's mean surface temperature. **Summative/Topic Assessment** ● Interactive Science assessments, formal lab sheets**,** experiments
	Enduring Understanding	**Resources**
	Students will demonstrate proficiency in asking questions, planning and carrying out investigations, designing solutions, engaging in argument from evidence, developing and using models, and constructing explanations and designing solutions.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.		

QUARTER 2 – 25 days
Big Idea: Human Impact

Standards: NGSS Earth and Space Science

MS-ESS3-3

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
- 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
- Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.
- Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.
- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus

GOAL

In this unit of study, students analyze and interpret data and design solutions to build on their understanding of the ways that human activities affect Earth's systems. The emphasis of this unit is the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of these uses. The crosscutting concepts of *cause and effect* and *the influence of science, engineering, and technology on society and the natural world* are called out as organizing concepts for these disciplinary core ideas.

Building on Unit 3, students define a problem by precisely specifying criteria and constraints for solutions as well as potential impacts on society and the natural environment; systematically evaluate alternative solutions; analyze data from tests of different solutions; combining the best ideas into an improved solution; and develop and iteratively test and improve their model to reach an optimal solution. In this unit of study students are expected to demonstrate proficiency in *analyzing and interpreting data* and *designing solutions.* Students are also expected to use these practices to demonstrate understanding of the core ideas.

Essential Questions	**Assessments**
1. How do we monitor the health of the environment (our life support system)? 2. Is it possible to predict and protect ourselves from natural hazards?	**Formative:** ● Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. **Summative/Topic Assessment** ● Interactive Science assessments, formal lab sheets**,** experiments

technology use varies from region to region and over time.

Standards: NGSS Engineering

MS-ETS1-1

- Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.
- 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.
- All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.
- The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.

MS-ETS1-2

- Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.

MS-ETS1-3

Enduring Understanding	**Resources**
Students are expected to demonstrate proficiency in asking questions, planning and carrying out investigations, designing solutions, and engaging in argument.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

● Analyze and interpret data to determine similarities and differences in findings. ● Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. **Career Ready Practices** CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.		

QUARTER 3 – 20 days

Big Idea:Relationships and Forms of Energy

Standards: NGSS Physical Science

MS-PS3-1

- Construct and interpret graphical displays of data to identify linear and nonlinear relationships.
- Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.
- Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. (

MS-PS3-2

- Develop a model to describe unobservable mechanisms.
- A system of objects may also contain stored (potential) energy, depending on their relative positions.
- When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.
- Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems.

MS-PS3-5

- Construct, use, and present oral and written arguments supported by empirical evidence

GOAL

In this unit, students use the practices of *analyzing and interpreting data*, *developing and using models*, and *engaging in argument from evidence* to make sense of relationship between energy and forces. Students develop their understanding of important qualitative ideas about the conservation of energy. Students understand that objects that are moving have kinetic energy and that objects may also contain stored (potential) energy, depending on their relative positions. Students also understand the difference between energy and temperature, and the relationship between forces and energy. The crosscutting concepts of *scale, proportion, and quantity*, *systems and system models*, and *energy and matter* are called out as organizing concepts for these disciplinary core ideas. Students use the practices of *analyzing and interpreting data*, *developing and using models*, and *engaging in argument from evidence*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Essential Questions

1. How can physics explain sports?
2. Is it better to have an aluminum (baseball/softball) bat or a wooden bat?
3. What would give you a better chance of winning a bowling match, using a basketball that you can roll really fast, or a bowling ball that you can only roll slowly?
4. Who can design the best roller coaster?

Assessments

Summative/Topic Assessment

- Construct and interpret graphical displays of data to identify linear and nonlinear relationships of kinetic energy to the mass of an object and to the speed of an object.
- Develop a model to describe what happens to the amount of potential energy stored in the system when the arrangement of objects interacting at a distance changes
- Use models to represent systems and their interactions, such as inputs, processes, and outputs, and energy and matter flows within

and scientific reasoning to support or refute an explanation or a model for a phenomenon. ● Science knowledge is based upon logical and conceptual connections between evidence and explanations ● When the motion energy of an object changes, there is inevitably some other change in energy at the same time. ● Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). **Career Ready Practices** CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.		systems. Models could include representations, diagrams, pictures, and written descriptions. ● Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. ● Conduct an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of an object. Do not include calculations of energy. **Summative/Topic Assessment** **:** ● Interactive Science assessments, formal lab sheets**,** experiments
	Enduring Understanding	**Resources**
	Students are expected to demonstrate proficiency in developing and using models and analyzing and interpreting data.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

QUARTER 3 – 30 days
Big Idea: Thermal Energy

Standards: NGSS Life Science

MS-LS3-1

- Develop and use a model to describe phenomena.
- 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.
- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.
- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.

MS-LS3-2

GOAL

Students develop and use models to describe how gene mutations and sexual reproduction contribute to genetic variation. Students understand how genetic factors determine the growth of an individual organism. They also demonstrate understanding of the genetic implications of sexual and asexual reproduction. The crosscutting concepts of *cause and effect* and *structure and function* provide a framework for understanding how gene structure determines differences in the functioning of organisms. Students are expected to demonstrate proficiency in *developing and using models*. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Essential Questions	**Assessments**
1. Why do kids look similar to their parents? 2. How do structural changes to genes (mutations) located on chromosomes affect proteins or affect the structure and function of an organism? 3. How do asexual reproduction and sexual reproduction affect the genetic variation of offspring?	**Formative:** ● 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. ● Develop and use a model to describe why sexual reproduction results in offspring with genetic variation.

● Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. ● Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. ● In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. ● Cause and effect relationships may be used to predict phenomena in natural systems. **Career Ready Practices** CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.		● Use models such as Punnett squares, diagrams, and simulations to describe the cause-and effect-relationship of gene transmission from parent(s) to offspring and resulting genetic variation. **Summative/Topic Assessment** Interactive Science assessments, formal lab sheets**,** experiments
	Enduring Understanding	**Resources**
	Students are expected to demonstrate proficiency in developing and using models, and planning and carrying out investigations.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

QUARTER 4 – 20 days
Big Idea: The Electromagnetic Spectrum

Standards: NGSS Physical Science

MS-PS4-1

- Use mathematical representations to describe and/or support scientific conclusions and design solutions
- Science knowledge is based upon logical and conceptual connections between evidence and explanations.
- A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude
- Graphs and charts can be used to identify patterns in data. (

MS-PS4-2

- Develop and use a model to describe phenomena.
- A sound wave needs a medium through which it is transmitted.
- When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light.
- The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends.

GOAL

In this unit of study, students *develop and use models, use mathematical thinking,* and *obtain, evaluate, and communicate information* in order to describe and predict characteristic properties and behaviors of waves. Students also apply their understanding of waves as a means of sending digital information. The crosscutting concepts of *patterns* and *structure and function* are used as organizing concepts for these disciplinary core ideas. Students *develop and use models, use mathematical thinking,* and *obtain, evaluate, and communicate information.* Students are also expected to use these practices to demonstrate understanding of the core ideas.

Essential Questions

1. How do cell phones work?
2. Why do surfers love physicists?
3. How do the light and sound system in the auditorium work?
4. If rotary phones worked for my grandparents, why did they invent cell phones?

Assessments

Formative:

- Use mathematical representations to describe and/or support scientific conclusions about how the amplitude of a wave is related to the energy in a wave.
- Use mathematical representations to describe a simple model.
- Develop and use models to describe the movement of waves in various materials.
- Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims that digitized signals are a more reliable way to encode and transmit information than analog signals are.

• A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. • However, because light can travel through space, it cannot be a matter wave, like sound or water waves. • Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. **MS-PS4-3** • Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings. • Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. • Structures can be designed to serve particular functions. • Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations • Advances in technology influence the progress of science and science has influenced advances in technology. **Career Ready Practices** CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using		**Summative/Topic Assessment** • Interactive Science assessments, formal lab sheets**,** experiments
	Enduring Understanding	**Resources**
	Students are expected to demonstrate proficiency in developing and using models, and planning and carrying out investigations.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

cultural global competence.		