Mullica Township School District

Science Curriculum
Grade 6

Board approval: 11/28/2018

MULLICA TOWNSHIP SCHOOL DISTRICT
Science Curriculum
GRADE 6

Content Area: SCIENCE

Course Title: Middle School	**Grade Level:** 6

UNIT 1 Growth, Development, and Reproduction of Organisms	20 days
UNIT 2 Matter and Energy in Organisms and Ecosystems	20 days
UNIT 3 Interdependent Relationships in Ecosystems	20 days
UNIT 4 Forces and Motion	25 days
UNIT 5 Types of Interactions	25 days
UNIT 6 Astronomy	20 days
UNIT 7 Weather and Climate	25 days
UNIT 8 none	

Date Created: 11/19/2018

Board Approved:

Created By: Barbara Rheault

MULLICA TOWNSHIP SCHOOL DISTRICT
Grade 6 - Unit 1

Content Area: Science

Unit Title: Growth, Development, and Reproduction of Organisms

Target Course/Grade Level: 6

Unit Summary

Students use data and conceptual models to understand how the environment and genetic factors determine the growth of an individual organism. They connect this idea to the role of animal behaviors in animal reproduction and to the dependence of some plants on animal behaviors for their reproduction. Students provide evidence to support their understanding of the structures and behaviors that increase the likelihood of successful reproduction by organisms. The crosscutting concepts of *cause and effect* and *structure and function* provide a framework for understanding the disciplinary core ideas. Students demonstrate grade-appropriate proficiency in *analyzing and interpreting data*, *using models*, *conducting investigations*, and *communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-LS1-4 and MS-LS1-5.

Primary Interdisciplinary Connections:

ELA/Literacy

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-4),(MS-LS1-5),

RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-5),

RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-4)

WHST.6-8.1 Write arguments focused on discipline content. (MS-LS1-4)

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-LS1-5)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5),

Mathematics

6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MSLS1-4), MS-LS1-5)

6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4),(MS-LS1-5)

21st Century Themes:

Career Ready Practices and Financial Literacy

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.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence
9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.
9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
through school, home, work, and extracurricular activities for use in a career.

Technology Integration: 6-8

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.
8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory
8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results
8.1.8.B.1 Synthesize and publish information about a local or global issue or event
8.1.8.D.4 Assess the credibility and accuracy of digital content.
8.1.8.E.1 Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.

Learning Targets

Performance Expectations

MS-LS1-4. Use argument 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
MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

Essential Questions	Disciplinary Core Ideas
● How does the location of a population impact its reproductive success? ● What causes some tree rings to be thick while others are so thin?	**LS1.B: Growth and Development of Organisms** ● Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4) ● Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4) ● Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)

Science and Engineering Practices	Crosscutting Concepts
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories. ● Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-5) **Engaging in Argument from Evidence** Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). ● Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS1-4)	**Cause and Effect** ● Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8) ● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4), (MSLS1-5)

Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
- Quiz/Activity: Math Connections interactive practice/quiz that uses grade-level appropriate math activities to address the concept.
- STEM Talk: View and discuss Teacher-Guided Read Aloud
- Assessment Review: View and interact with “Science Today - Watch It!” by Associated Press

Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented)

ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
- Modify Assessments
- Modify Grading
- Facilitate Appropriate Behavior
- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
- Provide Alternative Homework
- Provide Access to Special Equipment and Instructional Materials

Gifted and Talented

- Accelerate or enrich content.
- Reduce regular classroom work
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
- Schedule opportunities to work in homogeneous groupings with peers of similar ability and interests
- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
- Compact curriculum in areas that represent student strengths
- Create a plan outline and time frame for completion of assignments & alternate activities.
- Incorporate written independent study contracts to research topics of interest to become "resident experts."
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:

STEMScopes

- Reproduction In Plants and Animals
- Growth of Plants

Materials

Equipment

- Smartboard and Projector
- Chromebooks
- Science Lab

MULLICA TOWNSHIP SCHOOL DISTRICT
Grade 6 - Unit 2

Content Area: Science

Unit Title: Matter and Energy in Organisms and Ecosystems

Target Course/Grade Level: 6

Unit Summary

Students analyze and interpret data, develop models, construct arguments, and demonstrate a deeper understanding of the cycling of matter, the flow of energy, and resources in ecosystems. They are able to study patterns of interactions among organisms within an ecosystem. They consider biotic and abiotic factors in an ecosystem and the effects these factors have on

populations. They also understand that the limits of resources influence the growth of organisms and populations, which may result in competition for those limited resources. The crosscutting concepts of *matter and energy*, *systems and system models*, *patterns*, and *cause and effect* provide a framework for understanding the disciplinary core ideas. Students demonstrate grade-appropriate proficiency in analyzing and interpret data, developing models, and constructing arguments. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-LS2-1, MS-LS2-2, and MS-LS2-3.

Primary Interdisciplinary Connections:

ELA/Literacy
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-1),
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)
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)
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 –
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 Themes:
Career Ready Practices and Financial Literacy
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.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.
9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
through school, home, work, and extracurricular activities for use in a career.

Technology Integration: 6-8

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.
8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory
8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results
8.1.8.B.1 Synthesize and publish information about a local or global issue or event
8.1.8.D.4 Assess the credibility and accuracy of digital content.
8.1.8.E.1 Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.

Learning Targets

Performance Expectations

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Essential Questions	Disciplinary Core Ideas
● How does reducing competition impact populations? ● What is causing the decrease in polar bear populations? ● Why would a stable ecosystem never have more carnivores than herbivores? ● How would disease of one species impact the overall ecosystem?	**LS2.A: Interdependent Relationships in Ecosystems** ● Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1) ● In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1) ● Growth of organisms and population increases are limited by access to resources. (MS-LS2-1) ● Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial

	interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2) **LS2.B: Cycle of Matter and Energy Transfer in Ecosystems** ● 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. (MS-LS2-3)
Science and Engineering Practices **Developing and Using Models** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. ● Develop a model to describe phenomena. (MS-LS2-3) **Analyzing and Interpreting Data** Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. ● Analyze and interpret data to provide evidence for phenomena. (MS-LS2-1) **Constructing Explanations and Designing Solutions**	**Crosscutting Concepts** **Patterns** ● Patterns can be used to identify cause and effect relationships. (MS-LS2-2) **Cause and Effect** ● Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1) **Energy and Matter** ● The transfer of energy can be tracked as energy flows through a natural system. (MSLS2-3)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. ● Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2)	

Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
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Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented)

ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
- Modify Assessments
- Modify Grading
- Facilitate Appropriate Behavior
- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
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Gifted and Talented

- Accelerate or enrich content.
- Reduce regular classroom work
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
- Schedule opportunities to work in homogeneous groupings with peers of similar ability and interests
- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
- Compact curriculum in areas that represent student strengths
- Create a plan outline and time frame for completion of assignments & alternate activities.
- Incorporate written independent study contracts to research topics of interest to become "resident experts."
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:

STEMScopes

- Competition in Ecosystems
- Organism Interactions in Ecosystems
- Predation in Ecosystems
- Matter and Energy in Food Webs

Materials

Equipment

- Smartboard and Projector
- Chromebooks
- Science Lab

MULLICA TOWNSHIP SCHOOL DISTRICT
Grade 6 - Unit 3

Content Area: Science

Unit Title: Interdependent Relationships in Ecosystems

Target Course/Grade Level: 6

Unit Summary

Students build on their understandings of the transfer of matter and energy as they study patterns of interactions among organisms within an ecosystem. They consider biotic and abiotic

factors in an ecosystem and the effects these factors have on a population. They construct explanations for the interactions in ecosystems and the scientific, economic, political, and social justifications used in making decisions about maintaining biodiversity in ecosystems. The crosscutting concept of *stability and change* provide a framework for understanding the disciplinary core ideas.
This unit includes a two-stage engineering design process. Students first evaluate different engineering ideas that have been proposed using a systematic method, such as a tradeoff matrix, to determine which solutions are most promising. They then test different solutions, and combine the best ideas into a new solution that may be better than any of the preliminary ideas. Students demonstrate grade appropriate proficiency in *asking questions*, *designing solutions, engaging in argument from evidence, developing and using models*, and *designing solutions*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-LS2-4, MS-LS2-5, MS-ETS1-1, and MS-ETS1-3.

Primary Interdisciplinary Connections:

ELA/Literacy

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-4)
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-LS-4),(MS-LS2-5)
WHST.6-8.1 Write arguments to support claims with clear reasons and relevant evidence. (MS-LS2-4)
WHST.6-8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.(MS-LS2-4)
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1),(MS-ETS1-3)
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-ETS1-3)
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-ETS1-3)
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-ETS1-1)

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)
MP.2 Reason abstractly and quantitatively. (MS-ETS1-1),(MS-ETS1-3),
7.EE.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1),(MS-ETS1-3)

21st Century Themes:

Career Ready Practices and Financial Literacy

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.
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9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.
9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
through school, home, work, and extracurricular activities for use in a career.

Technology Integration: 6-8

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.
8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory
8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results
8.1.8.B.1 Synthesize and publish information about a local or global issue or event
8.1.8.D.4 Assess the credibility and accuracy of digital content.
8.1.8.E.1 Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.

Learning Targets

Performance Expectations

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Essential Questions	Disciplinary Core Ideas
● Why are invasive species a threat to an environment? ● Why is an ecosystem's overall health	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience** ● Ecosystems are dynamic in nature; their characteristics can vary over time.

dependent on biodiversity? ● How do human-made reefs impact the environment?	Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4) ● 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. (MS-LS2-5) **LS4.D: Biodiversity and Humans** ● Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5) **ETS1.B: Developing Possible Solutions** ● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary to MS-LS2-5) **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** ● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (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) **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)
Science and Engineering Practices **Engaging in Argument from Evidence** Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). ● Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS2-4) ● Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2-5) **Asking Questions and Defining Problems** Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models. ● Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1) **Analyzing and Interpreting Data** Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. ● Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3) **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** ● Science disciplines share common	**Crosscutting Concepts** **Stability and Change** ● Small changes in one part of a system might cause large changes in another part. (MSLS2-4),(MS-LS2-5) **Connections to Engineering, Technology, and Applications of Science** **Influence of Science, Engineering, and Technology on Society and the Natural World** ● The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-LS2-5) **Influence of Science, Engineering, and Technology on Society and the Natural World** ● All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1) ● The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1 **Connections to Nature of Science** **Science Addresses Questions About the Natural and Material World** ● Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS2-5)

rules of obtaining and evaluating empirical evidence. (MS-LS2-4)	

Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
- Quiz/Activity: Math Connections interactive practice/quiz that uses grade-level appropriate math activities to address the concept.
- STEM Talk: View and discuss Teacher-Guided Read Aloud
- Assessment Review: View and interact with “Science Today - Watch It!” by Associated Press

Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented)

ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
- Modify Assessments
- Modify Grading
- Facilitate Appropriate Behavior
- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
- Provide Alternative Homework
- Provide Access to Special Equipment and Instructional Materials

Gifted and Talented

- Accelerate or enrich content.
- Reduce regular classroom work
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
- Schedule opportunities to work in homogeneous groupings with peers of similar ability and interests
- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
- Compact curriculum in areas that represent student strengths
- Create a plan outline and time frame for completion of assignments & alternate activities.
- Incorporate written independent study contracts to research topics of interest to become "resident experts."
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:

STEMScopes

- The Dynamic Nature of Ecosystem
- Ecosystem Biodiversity
- Changes In Biodiversity

Materials

Equipment

- Smartboard and Projector
- Chromebooks
- Science Lab

MULLICA TOWNSHIP SCHOOL DISTRICT
Grade 6 - Unit 4

Content Area: Science

Unit Title: Forces and Motion

Target Course/Grade Level: 4

Unit Summary

Students use *system and system models* and *stability and change* to understanding ideas related to why some objects will keep moving and why objects fall to the ground. Students apply Newton's third law of motion to related forces to explain the motion of objects. Students also

apply an engineering practice and concept to solve a problem caused when objects collide. The crosscutting concepts of *system and system models* and *stability and change* provide a framework for understanding the disciplinary core ideas. Students 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*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-PS2-1, MS-PS2-2, MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, and MS-ETS1-4.

Primary Interdisciplinary 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-PS2-1)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS2-1),(MS-PS2-2)

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-PS2-1),(MS-PS2-2)

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)

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-ETS1-3)

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-ETS1-2),(MS-ETS1-3)

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-ETS1-2)

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-ETS1-1)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ETS1-4)

Mathematics

MP.2 Reason abstractly and quantitatively. (MS-PS2-1),(MS-PS2-2),

6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS2-1)

6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers. (MS-PS2-1),(MS-PS2-2)

7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-PS2-1),(MS-PS2-2)

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-PS2-1),(MS-PS2-2)
MP.2 Reason abstractly and quantitatively. (MS-ETS1-1), (MS-ETS1-2), (MS-ETS1-3), (MS-ETS1-4)
7.EE.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)
7.SP Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. (MS-ETS1-4)

21st Century Themes:

Career Ready Practices and Financial Literacy

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.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence
9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.
9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
through school, home, work, and extracurricular activities for use in a career.

Technology Integration: 6-8

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.
8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory
8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results
8.1.8.B.1 Synthesize and publish information about a local or global issue or event
8.1.8.D.4 Assess the credibility and accuracy of digital content.
8.1.8.E.1 Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.

Learning Targets

Performance Expectations

MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion

depends on the sum of the forces on the object and the mass of the object.
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

Essential Questions	Disciplinary Core Ideas
● Why will colliding objects change directions? ● How does the mass of an object affect its motion?	**PS2.A: Forces and Motion** ● For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1) ● The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2) ● All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MSPS2-2) **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. (MSETS1-4)
Science and Engineering Practices **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions. ● Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS2-2) **Constructing Explanations and Designing Solutions**	**Crosscutting Concepts** **Systems and System Models** ● Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. (MS-PS2-1),(MS-PS2-4) **Stability and Change** ● Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. (MS-PS2-2) **Influence of Science, Engineering, and Technology on Society and the Natural World** ● All human activity draws on natural resources and has both short and

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

- Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS2-2)

Asking Questions and Defining Problems

Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)

Developing and Using Models

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

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

Analyzing and Interpreting Data

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

- Analyze and interpret data to

long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)

- The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)

Connections to Engineering, Technology, and Applications of Science

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

- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-PS2-1)

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

Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
- Quiz/Activity: Math Connections interactive practice/quiz that uses grade-level appropriate math activities to address the concept.
- STEM Talk: View and discuss Teacher-Guided Read Aloud
- Assessment Review: View and interact with “Science Today - Watch It!” by Associated Press

Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented)

ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
- Modify Assessments
- Modify Grading
- Facilitate Appropriate Behavior
- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
- Provide Alternative Homework
- Provide Access to Special Equipment and Instructional Materials

Gifted and Talented

- Accelerate or enrich content.
- Reduce regular classroom work
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
- Schedule opportunities to work in homogeneous groupings with peers of similar ability and interests
- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
- Compact curriculum in areas that represent student strengths
- Create a plan outline and time frame for completion of assignments & alternate activities.
- Incorporate written independent study contracts to research topics of interest to become "resident experts."
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:

STEMScopes

- Newton's Third Law of Motion
- Changes In Motion, Force and Direction

Materials

Equipment

- Smartboard and Projector
- Chromebooks
- Science Lab

MULLICA TOWNSHIP SCHOOL DISTRICT
Grade 6 - Unit 5

Content Area: Science

Unit Title: Types of Interactions

Target Course/Grade Level: 6

Unit Summary

Students use *cause and effect*; *system and system models*; and *stability and change* to understand ideas that explain why some materials are attracted to each other while others are not. Students apply ideas about gravitational, electrical, and magnetic forces to explain a variety of phenomena including beginning ideas about why some materials attract each other while

others repel. In particular, students develop understandings that gravitational interactions are always attractive but that electrical and magnetic forces can be both attractive and negative. Students also develop ideas that objects can exert forces on each other even though the objects are not in contact, through fields. Students are expected to consider the influence of science, engineering, and technology on society and the natural world. Students are expected to demonstrate proficiency in *asking questions*, *planning and carrying out investigations*, *designing solutions*, and *engaging in argument*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-PS2-3, MS-PS2-4, and MS-PS2-5.

Primary Interdisciplinary 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-PS2-3)
RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS2-5)
WHST.6-8.1 Write arguments focused on discipline-specific content. (MS-PS2-4)
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-PS2-5)

Mathematics

MP.2 Reason abstractly and quantitatively. (MS-PS2-3)

21st Century Themes:

Career Ready Practices and Financial Literacy

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.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence
9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.
9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
through school, home, work, and extracurricular activities for use in a career.

Technology Integration: 6-8

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.
8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory
8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results
8.1.8.B.1 Synthesize and publish information about a local or global issue or event
8.1.8.D.4 Assess the credibility and accuracy of digital content.

8.1.8.E.1 Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.

Learning Targets

Performance Expectations

MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

Essential Questions

- Why do magnets sometimes attract objects and other times push them away?
- How does the Sun keep the planets in orbit?
- How can I make something move without touching it?

Disciplinary Core Ideas

PS2.B: Types of Interactions

- Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3)
- Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4)
- Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (MS-PS2-5)

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades 6–8 builds from grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and,

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS2-3),(MS-PS2-5)

Systems and System Models

- Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems.

when appropriate, frame a hypothesis based on observations and scientific principles. (MS-PS2-3) **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions. ● Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS2-2) **Engaging in Argument from Evidence** Engaging in argument from evidence in 6–8 builds from K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world. ● Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-PS2-4) **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** ● Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS2-2), (MS-PS2-4)	(MS-PS2-1), (MS-PS2-4),

Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
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Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented)

ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
- Modify Assessments
- Modify Grading
- Facilitate Appropriate Behavior
- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
- Provide Alternative Homework
- Provide Access to Special Equipment and Instructional Materials

Gifted and Talented

- Accelerate or enrich content.
- Reduce regular classroom work
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
- Schedule opportunities to work in homogeneous groupings with peers of similar ability and interests
- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
- Compact curriculum in areas that represent student strengths
- Create a plan outline and time frame for completion of assignments & alternate activities.
- Incorporate written independent study contracts to research topics of interest to become "resident experts."
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:

STEMScopes

- Electromagnetic Forces
- Gravitational Forces
- Force Fields

Materials

Equipment

- Smartboard and Projector
- Chromebooks
- Science Lab

MULLICA TOWNSHIP SCHOOL DISTRICT
Grade 6 - Unit 6

Content Area: Science

Unit Title: Astronomy

Target Course/Grade Level: 6

Unit Summary

This unit is broken down into three sub-ideas: the universe and its stars, Earth and the solar system, and the history of planet Earth. Students examine the Earth's place in relation to the solar system, the Milky Way galaxy, and the universe. There is a strong emphasis on a systems

approach and using models of the solar system to explain the cyclical patterns of eclipses, tides, and seasons. There is also a strong connection to engineering through the instruments and technologies that have allowed us to explore the objects in our solar system and obtain the data that support the theories explaining the formation and evolution of the universe. Students examine geosciences data in order to understand the processes and events in Earth's history. The crosscutting concepts of *patterns*, *scale, proportion, and quantity* and *systems and systems models* provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in *developing and using models* and *analyzing and interpreting data*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-ESS1-1, MS-ESS1-2, and MS-ESS1-3.

Primary Interdisciplinary Connections:

ELA/Literacy

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-3)

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-ESS1-3)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS1-1),(MS-ESS1-2)

Mathematics

MP.2 Reason abstractly and quantitatively. (MS-ESS1-3)

MP.4 Model with mathematics. (MS-ESS1-1),(MS-ESS1-2)

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS1-1),(MS-ESS1-2),(MS-ESS1-3)

7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-ESS1-1),(MS-ESS1-2),(MS-ESS1-3)

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-2)

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS1-2)

21st Century Themes:

Career Ready Practices and Financial Literacy

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.

CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
through school, home, work, and extracurricular activities for use in a career.

Technology Integration: 6-8

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.
8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory
8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results
8.1.8.B.1 Synthesize and publish information about a local or global issue or event
8.1.8.D.4 Assess the credibility and accuracy of digital content.
8.1.8.E.1 Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.

Learning Targets

Performance Expectations

MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system

Essential Questions	Disciplinary Core Ideas
● Do the moons of other planets also exhibit phases? ● How would the four seasons be affected if Earth's axis were not tilted? ● What causes stars to stay in orbit? ● Can another solar system form during my lifetime? ● How would the solar system be affected if the Sun were bigger? What if the Sun were smaller?	**ESS1.A: The Universe and Its Stars** ● Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) ● Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) **ESS1.B: Earth and the Solar System** ● The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MSESS1-3) ● This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential

	intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1) ● The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)
Science and Engineering Practices **Developing and Using Models** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. ● Develop and use a model to describe phenomena. (MS-ESS1-1), (MS-ESS1-2) **Analyzing and Interpreting Data** Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. ● Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)	**Crosscutting Concepts** **Patterns** ● Patterns can be used to identify cause and-effect relationships. (MS-ESS1-1) **Scale, Proportion, and Quantity** ● Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3), (MS-ESS1-4) **Systems and System Models** ● Models can be used to represent systems and their interactions. (MS-ESS1-2) **Connections to Engineering, Technology, and Applications of Science** **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. (MSESS1-3) **Connections to Nature of Science** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** ● Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1-), (MS-ESS1-2)

Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
- Quiz/Activity: Math Connections interactive practice/quiz that uses grade-level appropriate math activities to address the concept.
- STEM Talk: View and discuss Teacher-Guided Read Aloud
- Assessment Review: View and interact with “Science Today - Watch It!” by Associated Press

Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented)

ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
- Modify Assessments
- Modify Grading
- Facilitate Appropriate Behavior
- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
- Provide Alternative Homework
- Provide Access to Special Equipment and Instructional Materials

Gifted and Talented

- Accelerate or enrich content.
- Reduce regular classroom work
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
- Schedule opportunities to work in homogeneous groupings with peers of similar ability and interests
- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
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- Incorporate written independent study contracts to research topics of interest to become "resident experts."
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:

STEMScopes

- Patterns of Motion
- Earth, Sun, Moon System
- The Universe
- Formation of the Solar System
- The Solar System

Materials

Equipment

- Smartboard and Projector
- Chromebooks
- Science Lab

MULLICA TOWNSHIP SCHOOL DISTRICT
Grade 6 - Unit 7

Content Area: Science

Unit Title: Weather and Climate

Target Course/Grade Level: 6

Unit Summary

This unit is broken down into three sub-ideas: Earth's large-scale systems interactions, the roles of water in Earth's surface processes, and weather and climate. Students make sense of how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. A systems approach is also important here, examining the feedbacks between systems as energy from the Sun is transferred between systems and circulates through the ocean and atmosphere. The crosscutting concepts of *cause and effect*, *systems and system models*, and *energy and matter* are called out as frameworks for understanding the disciplinary core ideas. In this unit, students are expected to demonstrate proficiency in *developing and using models* and *planning and carrying out investigations* as they make sense of the disciplinary core ideas. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-ESS2-4, MS-ESS2-5, and MS-ESS2-6.

Primary Interdisciplinary Connections:

ELA/Literacy

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-5)

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-ESS2-5)

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-ESS2-5)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.(MS-ESS2-6)

Mathematics

MP.2 Reason abstractly and quantitatively.(MS-ESS2-5)

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-ESS2-5)

21st Century Themes:

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Learning Targets

Performance Expectations

MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Essential Questions	Disciplinary Core Ideas
● Why does it rain more when the weather gets hotter? ● How does a meteorologist (weather forecaster) know when it will rain? ● How accurate are hurricane prediction models? ● Why would the temperatures on the same latitude be different in different parts of the world? ● Do places located on the same latitude have the same climate? ● What is El Niño?	**ESS2.C: The Roles of Water in Earth's Surface Processes** ● Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4) ● The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MSESS2-5) ● Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4) ● Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6) **ESS2.D: Weather and Climate**

	● Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6) ● Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5) ● The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)
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- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:

STEMScopes

- The Water Cycle
- Water In The Atmosphere
- Prediction of Weather
- Water On Earth
- Influences On Weather and Climate
- Ocean's Influence On Weather and Climate

Materials

Equipment

- Smartboard and Projector
- Chromebooks
- Science Lab