# Mullica Township School District


# Science Curriculum
# Grade 8

Board approval: 11/28/2018

# MULLICA TOWNSHIP SCHOOL DISTRICT
## Science Curriculum
## GRADE 8

**Content Area:** SCIENCE

| **Course Title:** Middle School | **Grade Level:** 8 |
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| **UNIT 1**<br>Evidence of a Common Ancestry | | 25 days | |
| **UNIT 2**<br>Selection and Adaptation | | 20 days | |
| **UNIT 3**<br>Stability and Change On Earth | | 20 days | |
| **UNIT 4**<br>Human Impacts | | 15 days | |
| **UNIT 5**<br>Relationships Among Forms of Energy | | 25 days | |
| **UNIT 6**<br>Thermal Energy | | 20 days | |
| **UNIT 7**<br>The Electromagnetic Spectrum | | 25 days | |
| **UNIT 8**<br>none | | | |

**Date Created:** 11/19/2018

**Board Approved:**

**Created By:** Barbara Rheault

**MULLICA TOWNSHIP SCHOOL DISTRICT**
**Grade 8 - Unit 1**

**Content Area:** Science

**Unit Title:** Evidence of a Common Ancestry

**Target Course/Grade Level:** 8

**Unit Summary**

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.

This unit is based on MS-LS4-1, MS-LS4-2, and MS-LS4-3.

**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-LS4-1),(MSLS4-2),(MS-LS4-3)

**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-LS4-1),(MS-LS4-3)

**RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-3),(MS-LS4-4)

**WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-2)

**WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2)

**SL.8.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS4-2)

**SL.8.4** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS4-2)

Mathematics

**6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1),(MS-LS4-2)

**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.
**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
**9.2.4.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.3** Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.
**9.2.4.A.4** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
**9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

## 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.C.1** Collaborate to develop and publish work that provides perspectives on a global problem for discussions with learners from other countries
**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-LS4-1**. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
**MS-LS4-2**. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
**MS-LS4-3**. Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.

| Essential Questions | Disciplinary Core Ideas |
|---|---|
| ● How do new discoveries impact the fossil record?<br>● How are humans like birds?<br>● How similar are vertebrates before they are born? | **LS4.A: Evidence of Common Ancestry and Diversity**<br>● 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)<br>● 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)<br>● Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3) |
| **Science and Engineering Practices** | **Crosscutting Concepts** |
| **Analyzing and Interpreting Data**<br>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.<br>● Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3)<br>● Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1)<br><br>**Constructing Explanations and Designing Solutions**<br>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, | **Patterns**<br>● Patterns can be used to identify cause and effect relationships. (MS-LS4-2)<br>● Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1),(MS-LS4-3)<br><br>**Cause and Effect**<br>● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-5),(MS-LS4-6)<br><br>**Connections to Engineering, Technology, and Applications of Science**<br><br>**Interdependence of Science, Engineering, and Technology**<br>● Engineering advances have led to important discoveries in virtually every field of science, and scientific |

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| and theories.<br>● Apply scientific ideas to construct an explanation for realworld phenomena, examples, or events. (MS-LS4-2)<br><br>**Connections to Nature of Science**<br><br>**Scientific Knowledge is Based on Empirical Evidence**<br>● Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-1) | discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5)<br><br>**Connections to Nature of Science**<br><br>**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**<br>● Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1), (MS-LS4-2)<br><br>**Science Addresses Questions About the Natural and Material World**<br>● Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS4-5) |

## 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**

- Fossil Record
- Evolutionary History and Relationships
- Embryonic Development

**Materials**

**Equipment**

- Smartboard and Projector
- Chromebooks
- Science Lab

**MULLICA TOWNSHIP SCHOOL DISTRICT**
**Grade 8 - Unit 2**

**Content Area:** Science

**Unit Title:** Selection and Adaptation

**Target Course/Grade Level:** 8

**Unit Summary**

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.

This unit is based on MS-LS4-4, MS-LS4-5, and MS-LS4-6.

**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-LS4-4),(MS-LS4-5)
**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-LS4-4)
**WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-4)
**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-LS4-5)
**WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-4)
**SL.8.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.(MS-LS4-4)
**SL.8.4** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS4-4)

**Mathematics**

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

**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.
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**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

**9.2.4.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.3** Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.
**9.2.4.A.4** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
**9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

### 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.C.1** Collaborate to develop and publish work that provides perspectives on a global problem for discussions with learners from other countries
**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-LS4-4**. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
**MS-LS4-5**. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
**MS-LS4-6.** Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

| Essential Questions | Disciplinary Core Ideas |
|---|---|
| ● Why do animals of the same species have different color bodies?<br>● How can we buy so many different versions of the same vegetable at the grocery store?<br>● Why do humans still get bacterial infections? | LS4.B: Natural Selection<br>Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)<br>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 |

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| | passed on<br>to offspring. (MS-LS4-5)<br>LS4.C: Adaptation<br>Adaptation by natural selection acting over generations<br>is one important process by which species change over<br>time in response to changes in environmental conditions. Traits that support successful survival and<br>reproduction in the new environment become more<br>common; those that do not become less common.<br>Thus, the distribution of traits in a population changes.<br>(MS-LS4-6) |
| **Science and Engineering Practices**<br><br>**Analyzing and Interpreting Data**<br>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.<br>● Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3)<br>● Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1)<br><br>**Using Mathematics and Computational Thinking**<br>Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.<br>● Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6)<br><br>**Constructing Explanations and Designing Solutions**<br>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, | **Crosscutting Concepts**<br><br>**Patterns**<br>● Patterns can be used to identify cause and effect relationships. (MS-LS4-2)<br>● Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1),(MS-LS4-3)<br><br>**Cause and Effect**<br>● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-5),(MS-LS4-6)<br><br>**Connections to Engineering, Technology, and Applications of Science**<br><br>**Interdependence of Science, Engineering, and Technology**<br>● Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5)<br><br>**Connections to Nature of Science**<br><br>**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**<br>● Science assumes that objects and events in natural systems occur in |

and theories. Apply scientific ideas to construct an explanation for real world phenomena, examples, or events. (MS-LS4-2)

- Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4)

**Obtaining, Evaluating, and Communicating Information**

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.

- 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. (MS-LS4-5)

**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-LS4-1)

consistent patterns that are understandable through measurement and observation. (MS-LS4-1), (MS-LS4-2)

**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-LS4-5)

## Evidence of Learning

**Formative Assessments**

- Activity: Hook
- Activity: Investigate
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- 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**

- Natural Selection and Populations
- Artificial Selection
- Adaptation By Natural Selection

**Materials**

**Equipment**

- Smartboard and Projector
- Chromebooks
- Science Lab

**MULLICA TOWNSHIP SCHOOL DISTRICT**
**Grade 8 - Unit 3**

**Content Area:** Science

**Unit Title:** Stability and Change On Earth

**Target Course/Grade Level:** 8

**Unit Summary**

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.

This unit is based on MS-ESS3-1, MS-ESS3-2, MS-ESS3-4, and MS-ESS3-5.

**Primary Interdisciplinary Connections:**

**ELA/Literacy**

**RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1),(MS-ESS3-2),(MS-ESS3-4),(MS-ESS3-5)
**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-ESS3-2)
**WHST.6-8.1** Write arguments focused on discipline content. (MS-ESS3-4)
**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-ESS3-1)
**WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1),(MS-ESS3-4)

**Mathematics**

**MP.2** Reason abstractly and quantitatively. (MS-ESS3-2),(MS-ESS3-5)
**6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS3-4)
**7.RP.A.2** Recognize and represent proportional relationships between quantities. (MS-ESS3-4)
**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-ESS3-1), (MS-ESS3-2), MS-ESS3-4),(MS-ESS3-5)
**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-ESS3-1),(MS-ESS3-2),(MS-ESS3-4),(MS-ESS3-5)

**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.
**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

**9.2.4.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.3** Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.
**9.2.4.A.4** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
**9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

### 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.C.1** Collaborate to develop and publish work that provides perspectives on a global problem for discussions with learners from other countries
**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-ESS3-1.** Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
**MS-ESS3-2**. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
**MS-ESS3-4.** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
**MS-ESS3-5**. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

| Essential Questions | Disciplinary Core Ideas |
|---|---|
| ● What alternative energy options exist?<br>● Why are some countries more predisposed to natural hazards than others?<br>● What will happen to the total world carbon emissions if the human population continues to grow? | **ESS3.A: Natural Resources**<br>● 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) |

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- Has the sea level risen significantly?

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**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. (MSESS3-2)

**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)

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**Science and Engineering Practices**

**Asking Questions and Defining Problems**

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

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

**Analyzing and Interpreting Data**

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

- Analyze and interpret data to determine similarities and differences

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**Crosscutting Concepts**

**Patterns**

- Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2)

**Cause and Effect**

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1), (MS-ESS3-4)

**Stability and Change**

- Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)

**Connections to Engineering, Technology, and Applications of Science**

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| in findings. (MSESS3-2)<br><br>**Constructing Explanations and Designing Solutions**<br>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.<br>● 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. (MSESS3-1) | **Influence of Science, Engineering, and Technology on Society and the Natural World**<br>● 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-ESS3-1),(MS-ESS3-4)<br><br>**Connections to Nature of Science**<br><br>**Science Addresses Questions About the Natural and Material World**<br>● Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MSESS3-4) |

## 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**

- Human Dependence On Natural Resources
- Natural Hazard Predictions
- Consumption of Natural Resources
- Human Activities and Global Climate Change

**Materials**

**Equipment**

- Smartboard and Projector
- Chromebooks
- Science Lab

**MULLICA TOWNSHIP SCHOOL DISTRICT**
**Grade 8 - Unit 4**

**Content Area:** Science

**Unit Title:** Human Impacts

**Target Course/Grade Level:** 8

**Unit Summary**

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.

This unit is based on MS-ESS3-3, MS-ETS1-1, MS-ETS1-2, and MS-ETS1-3.

**Primary Interdisciplinary Connections:**

**ELA/Literacy**

**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-ESS3-3)
**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-ESS3-3)
**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)

**Mathematics**

**6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS3-3)
**7.RP.A.2** Recognize and represent proportional relationships between quantities. (MS-ESS3-3)
**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-ESS3-3)
**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-ESS3-3)

**MP.2** Reason abstractly and quantitatively. (MS-ETS1-1),(MS-ETS1-2),(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-ETS1-2),(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.
**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
**9.2.4.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.3** Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.
**9.2.4.A.4** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
**9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

## 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.C.1** Collaborate to develop and publish work that provides perspectives on a global problem for discussions with learners from other countries
**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-ESS3-3**. Apply scientific principles to design a method for monitoring and minimizing a

human impact on the environment.
**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.

| **Essential Questions** | **Disciplinary Core Ideas** |
|---|---|
| ● How can human activities disrupt the natural environment?<br><br>● What will happen to the total world carbon emissions if the human population continues to grow? | **ESS3.C: Human Impacts on Earth Systems**<br>● 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)<br>● 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)<br><br>**ETS1.A: Defining and Delimiting Engineering Problems**<br>● 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)<br><br>**ETS1.B: Developing Possible Solutions**<br>● A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)<br>● 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)<br>● Sometimes parts of different solutions can be combined to create a |

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| | solution that is better than any of its predecessors. (MS-ETS1-3)<br>● Models of all kinds are important for testing solutions. (MS-ETS1-4)<br><br>**ETS1.C: Optimizing the Design Solution**<br>● 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**<br><br>**Constructing Explanations and Designing Solutions**<br>Constructing explanations and designing solutions in 6–8 builds on K–5 experiences andprogresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.<br>● Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)<br><br>**Asking Questions and Defining Problems**<br>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.<br>● 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)<br><br>**Analyzing and Interpreting Data**<br>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 | **Crosscutting Concepts**<br><br>**Cause and Effect**<br>● Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3)<br><br>**Connections to Engineering, Technology, and Applications of Science**<br><br>**Influence of Science, Engineering, and Technology on Society and the Natural World**<br>● 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-ESS3-1),(MS-ESS3-4)<br>● The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-2),(MS-ESS3-3)<br><br>**Influence of Science, Engineering, and Technology on Society and the Natural World**<br>● All human activity draws on natural resources and has both short and |

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| data and error analysis.<br>● Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)<br><br>**Engaging in Argument from Evidence**<br>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.<br>● Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2) | long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)<br>● 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) |

## 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**

- Changes to Earth's Environment
- Consumption of Natural Resources

**Materials**

**Equipment**

- Smartboard and Projector
- Chromebooks
- Science Lab

**MULLICA TOWNSHIP SCHOOL DISTRICT**
**Grade 8 - Unit 5**

**Content Area:** Science

**Unit Title:** Relationships Among Forms of Energy

**Target Course/Grade Level:** 8

**Unit Summary**

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.

This unit is based on MS-PS3-1, MS-PS3-2, and MS-PS3-5.

**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-PS3-1),(MSPS3-5)
**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-PS3-1)
**WHST.6-8.1** Write arguments focused on discipline content. (MS-PS3-5)
**SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS3-2)

**Mathematics**

**MP.2** Reason abstractly and quantitatively. (MS-PS3-1), (MS-PS3-5)
**6.RP.A.1** Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3-1),(MS-PS3-5)
**6.RP.A.2** Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. (MS-PS3-1)
**7.RP.A.2** Recognize and represent proportional relationships between quantities. (MS-PS3-1),(MS-PS3-5)
**8.EE.A.1** Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1)
**8.EE.A.2** Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. (MS-PS3-1)
**8.F.A.3** Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS3-1),(MSPS3-5)

**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.
**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

**9.2.4.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.3** Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.
**9.2.4.A.4** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
**9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

### 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.C.1** Collaborate to develop and publish work that provides perspectives on a global problem for discussions with learners from other countries
**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-PS3-1.** Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
**MS-PS3-2.** Develop a model to describe that when the arrangement of objects interacting at a distance changes, different
amounts of potential energy are stored in the system.
**MS-PS3-5**. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

| Essential Questions | Disciplinary Core Ideas |
|---|---|
| ● How does speed impact energy?<br>● How does height impact energy?<br>● How can the cue ball in billiards, if hit correctly, cause multiple other balls to move?<br>● What energy changes occur while swinging? | **PS3.A: Definitions of Energy**<br>● 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)<br>● A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2)<br><br>**PS3.B: Conservation of Energy and Energy Transfer**<br>● When the motion energy of an object |

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| | changes, there is inevitably some other change in energy at the same time. (MS-PS3-5)<br>● Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3)<br><br>**PS3.C: Relationship Between Energy and Forces**<br>● 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) |
| **Science and Engineering Practices**<br><br>**Developing and Using Models**<br>Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.<br>● Develop a model to describe unobservable mechanisms. (MS-PS3-2)<br><br>**Analyzing and Interpreting Data**<br>Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.<br>● Construct and interpret graphical displays of data to identify linear and nonlinear relationships. (MS-PS3-1)<br><br>**Engaging in Argument from Evidence**<br>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 worlds.<br>● Construct, use, 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. (MS-PS3-5) | **Crosscutting Concepts**<br><br>**Scale, Proportion, and Quantity**<br>● 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-PS3-1)<br><br>**Systems and System Models**<br>● Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems. (MS-PS3-2)<br><br>**Energy and Matter**<br>● Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). (MS-PS3-5) |

| Connections to Nature of Science<br><br>**Scientific Knowledge is Based on Empirical Evidence**<br>● Science knowledge is based upon logical and conceptual connections between evidence and explanations (MS-PS3-5) | |
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## 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**

- Kinetic Energy
- Potential Energy
- Energy Transfer Between Objects
- Energy Transfer In Motion

**Materials**

**Equipment**

- Smartboard and Projector
- Chromebooks
- Science Lab

**MULLICA TOWNSHIP SCHOOL DISTRICT**
**Grade 8 - Unit 6**

**Content Area:** Science

**Unit Title:** Thermal Energy

**Target Course/Grade Level:** 8

**Unit Summary**

In this unit, students ask questions, plan and carry out investigations, engage in argument from evidence, analyze and interpret data, construct explanations, define problems and design

solutions as they make sense of the difference between energy and temperature. They use the practices to make sense of how the total change of energy in any system is always equal to the total energy transferred into or out of the system. The crosscutting concepts of energy and matter, scale, proportion, and quantity, and influence of science, engineering, and technology on society and the natural world are the organizing concepts for these disciplinary core ideas. Students ask questions, plan and carry out investigations, engage in argument from evidence, analyze and interpret data, construct explanations, define problems and design solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-PS3-3, MS-PS3-4, MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, and MS-ETS1-4.

**Primary Interdisciplinary Connections:**

**ELA/Literacy**

**RST.6-8.3** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS3-3),(MS-PS3-4)
**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-PS3-3),(MS-PS3-4)
**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**

**6.SP.B.5** Summarize numerical data sets in relation to their context. (MS-PS3-4)
**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.
**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
**9.2.4.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.3** Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.
**9.2.4.A.4** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
**9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

## 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.C.1** Collaborate to develop and publish work that provides perspectives on a global problem for discussions with learners from other countries
**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-PS3-3**. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal
energy transfer.
**MS-PS3-4**. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample
**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 do materials transfer heat differently?<br>● Why does ice melt?<br>● Why do objects have different melting points? | **PS3.A: Definitions of Energy**<br>● 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)<br><br>**PS3.B: Conservation of Energy and Energy Transfer**<br>● 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)<br>● Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3)<br><br>**ETS1.A: Defining and Delimiting an Engineering Problem**<br>● 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 is likely to limit possible solutions. (secondary to MS-PS3-3)<br><br>**ETS1.B: Developing Possible Solutions**<br>● A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (secondary to MS-PS3-3)<br><br>**ETS1.A: Defining and Delimiting Engineering Problems** |

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| | ● 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)<br><br>**ETS1.B: Developing Possible Solutions**<br>● A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)<br>● 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)<br>● Sometimes parts of different solutions can be combined to create a olution that is better than any of its predecessors. (MS-ETS1-3)<br>● Models of all kinds are important for testing solutions. (MS-ETS1-4)<br><br>**ETS1.C: Optimizing the Design Solution**<br>● 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)<br>● 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**<br><br>**Planning and Carrying Out Investigations**<br>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.<br>● Plan an investigation individually and | **Crosscutting Concepts**<br><br>**Scale, Proportion, and Quantity**<br>● 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-PS3-4) |

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-PS3-4)

**Constructing Explanations and Designing Solutions**

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

- Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system. (MS-PS3-3)

**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-PS3-4)

**Asking Questions and Defining Problems**

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

- 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.

**Energy and Matter**

- The transfer of energy can be tracked as energy flows through a designed or natural system. (MSPS3-3)

**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)

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| ● Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)<br><br>**Analyzing and Interpreting Data**<br>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.<br>● Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)<br><br>**Engaging in Argument from Evidence**<br>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.<br>● 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**

- Energy Transfer Optimization
- Thermal Energy Transfer
- Energy Transfer and Temperature

**Materials**

**Equipment**

- Smartboard and Projector
- Chromebooks
- Science Lab

**MULLICA TOWNSHIP SCHOOL DISTRICT**
**Grade 8 - Unit 7**

**Content Area:** Science

**Unit Title:** The Electromagnetic Spectrum

**Target Course/Grade Level:** 8

**Unit Summary**

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.

This unit is based on MS-PS4-1, MS-PS4-2, and MS-PS4-3.

**Primary Interdisciplinary Connections:**

**ELA/Literacy**

**RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts. (MS-PS4-3)
**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-PS4-3)
**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-PS4-3)
**WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3)
**SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS4-1),(MS-PS4-2)

**Mathematics**

**MP.2** Reason abstractly and quantitatively. (MS-PS4-1)
**MP.4** Model with mathematics. (MS-PS4-1)
**6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS4-1)
**6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS4-1)
**7.RP.A.2** Recognize and represent proportional relationships between quantities. (MS-PS4-1)
**8.F.A.3** Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS4-1)

**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.
**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
**9.2.4.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.3** Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.

**9.2.4.A.4** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
**9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

### 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.C.1** Collaborate to develop and publish work that provides perspectives on a global problem for discussions with learners from other countries
**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-PS4-1**. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
**MS-PS4-2.** Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
**MS-PS4-3.** Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

| Essential Questions | Disciplinary Core Ideas |
|---|---|
| ● Why can sounds range from barely audible to deafeningly loud?<br>● Why do I hear things differently when I am talking under water?<br>● What causes rainbows?<br>● How do you see color?<br>● How does my favorite tv show get to my living room? | **PS4.A: Wave Properties**<br>● A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1)<br>● A sound wave needs a medium through which it is transmitted. (MS-PS4-2)<br><br>**PS4.B: Electromagnetic Radiation**<br>● 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)<br>● 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) |

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| | ● 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)<br>● However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2)<br><br>**PS4.C: Information Technologies and Instrumentation**<br>● Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3) |
| **Science and Engineering Practices**<br><br>**Developing and Using Models**<br>Modeling in 6–8 builds on K–5 and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.<br>● Develop and use a model to describe phenomena. (MS-PS4-2)<br><br>**Using Mathematics and Computational Thinking**<br>Mathematical and computational thinking at the 6–8 level builds on K–5 and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.<br>● Use mathematical representations to describe and/or support scientific conclusions and design solutions. (MS-PS4-1)<br><br>**Obtaining, Evaluating, and Communicating Information**<br>Obtaining, evaluating, and communicating information in 6-8 builds on K-5 and progresses to evaluating the merit and validity of ideas and methods.<br>● Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings. (MS-PS4-3)<br><br>**Connections to Nature of Science** | **Crosscutting Concepts**<br><br>**Patterns**<br>● Graphs and charts can be used to identify patterns in data. (MS-PS4-1)<br><br>**Structure and Function**<br>● 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-PS4-2)<br>● Structures can be designed to serve particular functions. (MS-PS4-3)<br><br>**Connections to Engineering,Technology, and Applications of Science**<br><br>**Influence of Science, Engineering, and Technology on Society and the Natural World**<br>● Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations. (MS-PS4-3)<br><br>**Connections to Nature of Science**<br><br>**Science is a Human Endeavor**<br>● Advances in technology influence the progress of science and science has influenced advances |

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| **Scientific Knowledge is Based on Empirical Evidence**<br>● Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS4-1) | |

## 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**

- Introduction to Properties of Waves
- Modeling Waves Through Various Mediums
- Modeling Electromagnetic Waves
- Properties of Visible Light
- Digital vs. Analog Signals

**Materials**

**Equipment**

- Smartboard and Projector
- Chromebooks
- Science Lab