Pacing Guide	
Content Area: Science	
Grade Level: 5	
Unit 1: Properties of Matter	**September**
Unit 2: Changes to Matter	**October**
Unit 3: Energy and Matter in Ecosystems	**November – December**
Unit 4: Water on the Earth	**January – February**
Unit 5: Earth Systems	**March – April**
Unit 6: Interactions Within the Earth, Sun and Moon System	**May – June**

Unit Title: Properties of Matter	Grade Level: 5	Time Frame: 1 month

Standards:

Make observations and measurements to identify materials based on their properties. *[Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass and weight.]* **(5-PS1-3)**

Develop a model to describe that matter is made of particles too small to be seen. *[Clarification Statement: Examples of evidence could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]* **(5-PS1-1**

Enduring Understanding:

- ***When matter changes, does its weight change?***

In this unit of study, students describe that matter is made of particles too small to be seen by developing a model. The crosscutting concept of *scale, proportion, and quantity* is called out as an organizing concept for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in *developing and using models*, *planning and carrying out investigations*, and use these practices to demonstrate understanding of the core ideas.

Essential Questions:

- *How can properties be used to identify materials?*
- *What kind of model would best represent/describe matter as made of particles that are too small to be seen?*

Knowledge and Skills:

- Natural objects exist from the very small to the immensely large.
- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by means other than seeing.
- A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.

Demonstration of Learning/Assessment:

- Measure and describe physical quantities such as weight, time, temperature, and volume.
- Make observations and measurements to produce data that can serve as the basis for evidence for an explanation of a phenomenon.
- Make observations and measurements to identify materials based on their properties. Examples of materials to be identified could include:
  - ✓ Baking soda and other powders
  - ✓ Metals
  - ✓ Minerals
  - ✓ Liquids

  Examples of properties could include:
  - ✓ Color
  - ✓ Hardness
  - ✓ Reflectivity
  - ✓ Electrical conductivity
  - ✓ Thermal conductivity

	✓ Response to magnetic forces Solubility ✓ Develop a model to describe phenomena. ✓ Develop a model to describe that matter is made of particles too small to be seen. (Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.) Examples of evidence could include: ✓ Adding air to expand a basketball ✓ Compressing air in a syringe ✓ Dissolving sugar in water ✓ Evaporating salt water
Suggested Tasks and Activities: •	**Resources/Tech Integration:** Pearson Text, BrainPop, Sample Open Education Resources p. 6 Teacher Professional Learning Resources p. 6

Connecting English Language Arts/Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

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

Mathematics

- Reason abstractly and quantitatively. (5-PS1-1) (5-PS1-3) **MP.2**
- Model with mathematics. (5-PS1-1) **MP.4**
- Use appropriate tools strategically. (5-PS1-3) **MP.5**
- Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1) **5.NBT.A.1**
- Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1) **5.NF.B.7**
- Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1) **5.MD.C.3**
- Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft., and improvised units. (5-PS1-1) **5.MD.C.4**

Modifications

***As per the Recommendation of the NJDOE Science Model Curriculum**

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.

Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Unit Title: Changes to Matter	Grade Level: 5	Time Frame: 1 month

Standards:

Conduct an investigation to determine whether the mixing of two or more substances results in new substances. (5-PS1-4)

Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. *[Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.]* [Assessment Boundary: Assessment does not include distinguishing mass and weight.]. **(5-PS1-2)**

Enduring Understanding:

If I have a frozen water bottle that weighs 500 mg, how much will it weigh if the water melts?

In this unit of study, students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. The crosscutting concepts of *cause and effect* and *scale, proportion, and quantity* are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *planning and carrying out investigations* and *using mathematics and computational thinking*. Students are expected to use these practices to demonstrate understanding of the core ideas.
This unit is based on 5-PS1-4 and 5-PS1-2.

Essential Questions:

- *Would slime be considered a liquid or a solid?*
- *How can baking soda and vinegar burst a zip-lock bag?*

Knowledge and Skills:

- Cause-and-effect relationships are routinely identified, tested, and used to explain change.
- When two or more different substances are mixed, a new substance with different properties may be formed.
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.
- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.
- No matter what reaction or change in properties occurs, the total weight of the substances does not change. *(Note: Mass and weight are not distinguished at this grade level.)*

Demonstration of Learning/Assessment:

Students who understand the concepts are able to:

- Measure and describe physical quantities such as weight, time, temperature, and volume.
- Measure and graph quantities such as weight to address scientific and engineering questions and problems.
- Measure and graph quantities to provide evidence that regardless of the type of change that occurs when substances are heated, cooled, or mixed, the total weight is conserved. *(Note: Assessment does not include distinguishing between mass and weight.)*

Examples of reactions or changes could include:

- Phase changes

• Science assumes consistent patterns in natural systems.	• Dissolving • Mixing
Suggested Tasks and Activities: •	**Resources/Tech Integration:** Pearson Text, BrainPop, **Sample Open Education Resources p. 6 , Teacher Professional Learning Resources p. 6, Appendix A: NGSS and Foundations p. 7**

Connecting English Language Arts/Literacy and Mathematics ***As per the Recommendation of the NJDOE Science Model Curriculum**
English Language Arts/Literacy Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2),(5-PS1-4) **W.5.7** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-PS1-2)(5-PS1-4) **W.5.8** Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-PS1-2),(5-PS1-4) **W.5.9** Mathematics Reason abstractly and quantitatively. (5-PS1-2) **MP.2** Model with mathematics. (5-PS1-2) **MP.4** Use appropriate tools strategically. (5-PS1-2) **MP.5** Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. (5-PS1-2) **5.MD.A.1**
Modifications ***As per the Recommendation of the NJDOE Science Model Curriculum** *(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)* • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). • Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies). • Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Unit Title: Energy and Matter in Ecosystems	Grade Level: 5	Time Frame: 1 month

Standards:

Support an argument that plants get the materials they need for growth chiefly from air and water. [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.] (5-LS1-1)

Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.[Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.] (5-LS2-1)

Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. [Clarification Statement: Examples of models could include diagrams, and flow charts.] (5-PS3-1)

Enduring Understanding:

What happens to the matter and energy that are part of each organism? In this unit of study, students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment, and they can explain that energy in animals' food was once energy from the sun. The crosscutting concepts of energy and matter and systems and system models are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in 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 5-LS1-1, 5-LS2-1, and 5-PS3-1.

Essential Questions:

Where do plants get the materials they need for growth?

How does matter move among plants, animals, decomposers, and the environment?

How can energy in animals' food be traced to the sun?

Knowledge and Skills:

- Matter is transported into, out of, and within systems.
- Plants acquire their material for growth chiefly from air and water.
- Science explanations describe the mechanisms for natural events.
- A system can be described in terms of its components and their interactions.
- The food of almost any kind of animal can be traced back to plants.
- Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants.
- Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as decomposers.

Demonstration of Learning/Assessment:

Students who understand the concepts are able to:

- Describe how matter is transported into, out of, and within systems.
- Support an argument with evidence, data, or a model.
- Support an argument that plants get the materials they need for growth chiefly from air and water. (Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.)
- Describe a system in terms of its components and interactions.
- Develop a model to describe phenomena.

• Decomposition eventually restores (recycles) some materials back to the soil. • Organisms can survive only in environments in which their particular needs are met. • Energy can be transferred in various ways and between objects. • The energy released from food was once energy from the sun, which was captured by plants in the chemical process that forms plant matter (from air and water). • Food provides animals with the materials they need for body repair and growth and the energy they need for motion and to maintain body warmth.	• Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. (Assessment does not include molecular explanations.) • Emphasis is on the idea that matter that is not food—such as air, water, decomposed materials in soil—is changed into matter that is food. Examples of systems could include: ⎪ Organisms ⎪ Ecosystems ⎪ Earth • Describe how energy can be transferred in various ways and between objects. • Use models to describe phenomena. • Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. • • Examples of models could include: Diagrams Flowcharts
Suggested Tasks and Activities: •	**Resources/Tech Integration:** Pearson Text, BrainPop, Sample Open Education Resources p. 6 , Teacher Professional Learning Resources p. 6, Appendix A: NGSS and Foundations p. 7

Connecting English Language Arts/Literacy and Mathematics ***As per the Recommendation of the NJDOE Science Model Curriculum**
English Language Arts/Literacy Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-LS1-1) RI.5.1 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-LS2-1), (5-PS3-1) RI.5.7 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-LS1-1) RI.5.9 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-LS1-1) W.5.1 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-LS2-1), (5-PS3-1) SL.5.5 Mathematics Reason abstractly and quantitatively. (5-LS1-1), (5-LS2-1) MP.2 Model with mathematics. (5-LS1-1), (5-LS2-1) MP.4 Use appropriate tools strategically. (5-LS1-1) MP.5 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. (5-LS1-1) 5.MD.A.1
Modifications ***As per the Recommendation of the NJDOE Science Model Curriculum**

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

• Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

• Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).

• Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

• Use project-based science learning to connect science with observable phenomena.

• Structure the learning around explaining or solving a social or community-based issue.

• Provide ELL students with multiple literacy strategies.

• Collaborate with after-school programs or clubs to extend learning opportunities.

• Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Unit Title: Water on the Earth	Grade Level: 5	Time Frame: 1 month

Standards:

Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.] (5- ESS2-2)

Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. (5-ESS3-1)

Enduring Understanding:

How do individual communities use science ideas to protect Earth's resources and environment? In this unit of study, students describe and graph data to provide evidence about the distribution of water on Earth. The crosscutting concepts of scale, proportion, quantity and systems, and systems models are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade appropriate proficiency in using mathematics and computational thinking and in obtaining, evaluating, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on 5-ESS2-2 and 5-ESS3-1.

Essential Questions:

- Where is water found on the Earth? What percentage of the Earth's water is fresh water?
- How do individual communities use science ideas to protect Earth's resources and environment?

Knowledge and Skills:

- Standard units are used to measure and describe physical quantities such as weight and volume.
- Nearly all of Earth's available water is in the ocean.
- Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.
- A system can be described in terms of its components and their interactions.
- Science findings are limited to questions that can be answered with empirical evidence.
- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.
- Individuals and communities are doing things to help protect Earth's resources and environments.

Demonstration of Learning/Assessment:

Students who understand the concepts are able to:

- Describe physical quantities, such as weight and volume, in standard units.
- Describe and graph quantities such as area and volume to address scientific questions.
- Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. (Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.).
- Describe a system in terms of its components and interactions.
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Suggested Tasks and Activities:

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Resources/Tech Integration: Pearson Text, BrainPop, Sample Open Education Resources p. 6 , Teacher Professional Learning Resources p. 6, Appendix A: NGSS and Foundations p. 7

Connecting English Language Arts/Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

Students use print and digital sources to gather information and data that describe the amount of fresh water and salt water on the Earth and where it is found. As students gather information, they should organize the information into graphs, analyze and interpret the information to answer questions, and summarize the information in order to describe the amounts and percentages of fresh water and salt water on the Earth and to provide evidence about the distribution of water in oceans, lakes, streams, and reservoirs. Students also use several print and digital resources to find examples of:

- ✓ The effects of human activities in agriculture, industry, and everyday life on Earth's resources and environments
- ✓ Ways in which communities are using science ideas to protect Earth's resources and environments. Students summarize and paraphrase the information and use it when creating presentations that describe ways in which communities are using science ideas to protect Earth's resources and environments. The presentation should include both oral and written components, and a list of sources should be included with the presentation.

Mathematics

Students model with mathematics by using tables, charts, and/or graphs to organize data and information they collect. This includes the amount of fresh and salt water on Earth, the locations of both fresh and salt water on Earth, how human activities affect Earth's resources, and ways in which communities protect the Earth's resources and environments. Students also reason abstractly and quantitatively when analyzing these data to use as evidence to support their thinking.

Modifications

***As per the Recommendation of the NJDOE Science Model Curriculum**

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• Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
• Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
• Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
• Use project-based science learning to connect science with observable phenomena.
• Structure the learning around explaining or solving a social or community-based issue.
• Provide ELL students with multiple literacy strategies.
• Collaborate with after-school programs or clubs to extend learning opportunities.
• Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

<table>
<tr><td>Unit Title: Earth Systems</td><td>Grade Level: 5</td><td>Time Frame: 1 month</td></tr>
<tr><td colspan="3">Standards:
Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.] (5-ESS2-1)

Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment. (5-ESS3-1)</td></tr>
<tr><td colspan="2">Enduring Understanding:
How do individual communities use science ideas to protect Earth’s resources and environment? In this unit of study, students are able to describe ways in which the geosphere, biosphere, hydrosphere, and atmosphere interact. The crosscutting concept of systems and system models is called out as an organizing concept for this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency in developing and using models, obtaining, evaluating, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on 5-ESS2-1 and 5-ESS3-1.</td><td>Essential Questions:

• In what ways do the geosphere, biosphere, hydrosphere, and/or atmosphere interact?

• How do individual communities use science ideas to protect Earth’s resources and environment?</td></tr>
<tr><td colspan="2">Knowledge and Skills:
• A system can be described in terms of its components and their interactions.
• Earth’s major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans).
• The Earth’s major systems interact in multiple ways to affect Earth’s surface materials and processes.
• The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate.
• Winds and clouds in the atmosphere interact with landforms to determine patterns of weather.</td><td>Demonstration of Learning/Assessment:
Students who understand the concepts are able to:
• Describe a system in terms of its components and interactions.
• Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
• Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.</td></tr>
<tr><td colspan="2">Suggested Tasks and Activities:
•</td><td>Resources/Tech Integration: Pearson Text, BrainPop, Sample Open Education Resources p. 6 , Teacher Professional Learning Resources p. 6, Appendix A: NGSS and Foundations p. 7</td></tr>
</table>

Connecting English Language Arts/Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

In this unit, students can use information from print and digital sources to build their understanding of Earth's major systems and the interactions that occur within and between them. As students read and gather information from multiple print or digital sources, they should use the information to make inferences, answer questions, participate in discussions, solve problems, and support their thinking about the interactions that occur among Earth's systems and the impact that humans have on Earth's resources and environments. As students build models to explain the interactions between the systems and research ways in which individual communities use science ideas to protect the Earth's resources and environments, they can enhance their work with multimedia components, such as graphics and sound and visual displays.

Mathematics

In this unit, students should:

- Reason abstractly and quantitatively when analyzing data used as evidence to explain how Earth's major systems interact and how human activities affect Earth's resources.) Model with mathematics by using tables, charts, or graphs to organize data and information they collect to support explanations about the interactions that occur within and between Earth's systems.
- Represent real-world and mathematical relationships through graphing. For example, students can graph data to show the relationship between the amount of rainfall that occurs and changes in air temperature or pressure or the relationship between the types or number of organisms living at various altitudes.

<u>Modifications</u>
***As per the Recommendation of the NJDOE Science Model Curriculum**

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Unit Title: Interactions within the Earth, Sun, and Moon system	**Grade Level: 5**	**Time Frame: 1 month**

Standards:

Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.] (5-ESS2-1)

Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. (5-ESS3-1)

Enduring Understanding:

How do individual communities use science ideas to protect Earth's resources and environment? In this unit of study, students are able to describe ways in which the geosphere, biosphere, hydrosphere, and atmosphere interact. The crosscutting concept of systems and system models is called out as an organizing concept for this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency in developing and using models, obtaining, evaluating, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on 5-ESS2-1 and 5-ESS3-1.

Essential Questions:

- In what ways do the geosphere, biosphere, hydrosphere, and/or atmosphere interact?
- How do individual communities use science ideas to protect Earth's resources and environment?

Knowledge and Skills:

- A system can be described in terms of its components and their interactions.
- Science findings are limited to questions that can be answered with empirical evidence.
- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.
- Individuals and communities are doing things to help protect Earth's resources and environments.

Demonstration of Learning/Assessment:

Students who understand the concepts are able to:

- Describe a system in terms of its components and interactions.
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Suggested Tasks and Activities:

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Resources/Tech Integration: Pearson Text, BrainPop, Sample Open Education Resources p. 6 , Teacher Professional Learning Resources p. 6, Appendix A: NGSS and Foundations p. 7

Connecting English Language Arts/Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

In this unit, students can use information from print and digital sources to build their understanding of Earth's major systems and the interactions that occur within and between them. As students read and gather information from multiple print or digital sources, they should use the information to make inferences, answer questions, participate in discussions, solve problems, and support their thinking about the interactions that occur among Earth's systems and the impact that humans have on Earth's resources and environments. As students build models to explain the interactions between the systems and research ways in which individual communities use science ideas to protect the Earth's resources and environments, they can enhance their work with multimedia components, such as graphics and sound and visual displays.

Mathematics

In this unit, students should:

- Reason abstractly and quantitatively when analyzing data used as evidence to explain how Earth's major systems interact and how human activities affect Earth's resources.
- Model with mathematics by using tables, charts, or graphs to organize data and information they collect to support explanations about the interactions that occur within and between Earth's systems.
- Represent real-world and mathematical relationships through graphing. For example, students can graph data to show the relationship between the amount of rainfall that occurs and changes in air temperature or pressure or the relationship between the types or number of organisms living at various altitudes.

<u>Modifications</u>
***As per the Recommendation of the NJDOE Science Model Curriculum**

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.

- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Pacing Guide	
Content Area: Science	
Grade Level: 6	
Unit 1: Astronomy	**September –November**
Unit 2: Ecosystems	**November – January**
Unit 3: Earth and Human Activity	**February - April**
Unit 4: Waves	**April - June**

Unit Title: Astronomy	Grade Level: 6	Time Frame: One Month

Standards:

MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]

MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).]

MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system. [Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.]

MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.]

Enduring Understanding:	**Essential Questions:**
Students understand the Earth's place in relation to the solar system, Milky Way galaxy, and universe. How to explain astronomical and other observations of the cyclic patterns of eclipses, tides, and seasons**.** Instruments and technologies have allowed us to explore the objects in our solar system and obtain the data that support the theories that explain the formation and evolution of the universe	• **What is Earth's place in the Universe?** • **What makes up our solar system and how can the motion of Earth explain seasons and eclipses?**

Knowledge and Skills:

- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.
- This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.
- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.
- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.
- The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.
- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.

Demonstration of Learning/Assessment:	
Unit One: Earth, Moon, and Sun Systems Exit Slip 1: Why do the stars appear to move Exit Slip 2: Contrast the Earth's two motions Exit Slip 3 : Using the diagram explain what has more gravitational force Exit Slip 4: Identify the moon phases that come before and after the picture Exit Slip 5: Sketch a solar eclipse Exit Slip 6: Sketch a neap tide and spring tide include rotation, revolution, axis, and scale Station Topic 1: Rotation and Revolutions Station Topic 2: Gravity and Inertia Station Topic 3: Tides Station Topic 4: Review Lunar cycle and Reason's for Seasons Quiz 1: The Sky From Earth and Earth From Space Quiz 2: Gravity and Motion Quiz 3: Phases and Eclipses Quiz 4: Tides Lab 1: Calculating Gravity on other planets Lab 2: Pick- a- Project Moon phases with follow up questions (foldable, illustration, cut and paste) Test 1: Constellations, Reasons for the Seasons, and Gravity Test 2: Phases, Eclipses, and Tides **Culminating Activity: Students will create double line graph model and cite evidence data to analyze what time of day the spring and neap tides had.** **Tides Graphing Lab**	**Unit Two: Galaxies** Exit Slip 1: If astronomers map two stars for 6 months, and Star "A" appear to move more than "Star B" cite evidence from the text supporting the claim that Star A is closer to the Earth Exit Slip 2: Explain why Earth's location inside the Milky Way Galaxy is ideal? Exit Slip 3: Describe two pieces of evidence from the text and media that support the evidence of the Big Bang Station 1: Galaxies Quiz 1: Scale of the Universe Quiz 2: Star Systems and Galaxies Quiz 3: The Expanding Universe Learning Menu: Scale of Universe Think-Tac-Toe: Galaxies Think-Tac-Toe Expanding Universe Test 1: The Universe **Culminating Activity: Students will watch selected episode from Cosmos and read informational text article Dark Matter. Students will cite evidence in 4 paragraph essay that supports the claim that "The universe is expanding due to the big bang theory"** **The Expanding Universe Essay**

Suggested Tasks and Activities:

Unit One : Earth, Moon, and Sun Systems

- Stations on
  - Gravity and Intertia
  - Tides
  - Reasons for the Seasons, Solstices, and Equinoxes
  - Eclipses
  - Moon phases
- BrainPOP and Study Jams
  - Gravity
  - Solstice and Equinoxes
  - Eclipses
  - Reasons for the Seasons
  - Galaxies
  - Moon Phases
- Bill Nye
  - Reasons for the Seasons
- Modeling Earth, moon, and sun with students
- PowerPoint notes
- Simulations
  - Tides
  - Gravity and Orbits
  - Moon phases

Unit Two: Stars, Galaxies, and the Universe

- Learning Menu Scale of the Universe
- Think-Tac-Toe Star Systems and Galaxies
- Think-Tac-Toe The Expanding Universe
- PowerPoint Galaxies and Star Systems
- Stations
  - Galaxies
- Selected Episodes from "Cosmos"
  - Episode 4
- BrainPOP
  - Scientific Notation
  - Galaxies
  - Blackholes
  - Big Bang
  - Dark Matter
  - Edwin Hubble Telescopes
- Study Jams
  - Sizing up the Universe
- Pearson
  - Galaxies
  - Universe

Resources:

Unit 1: Earth, Moon, and Sun Systems

BrainPOP seasons
BrainPOP Solstices and Equinoxes
BrainPOP Eclipses
BrainPOP Gravity
BrainPOP Moon phases
BrainPOP Tides
Study Jams Tides
Study Jams Gravity
Study Jams Moon
Study Jams Day on Earth
Symbaloo Tides
Pearson Interactive Simulations Earth Moon and Sun Systems

Unit Two : Stars, Galaxies, and the Expanding Universe

BrainPOP Scientific Notation
BrainPOP Blackholes
BrainPOP Galaxies
BrainPOP Big Bang
BrainPOP Dark Matter
BrainPOP Edwin Hubble (Telescopes)
Study Jams Universe
Pearson Scale of the Universe
Pearson Galaxies
Pearson Expanding Universe

Tech Integration:

- Simulations
  - Phet : Gravity and Tides
  - Symbaloo- Tides and Eclipses

Connecting English Language Arts/ Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

- Include multimedia components and visual displays in presentations to describe the cyclical patterns of lunar phases, eclipses of the sun and moon, seasons, and the role of gravity in the motions within galaxies and the solar system. The presentation needs to clarify claims and findings and emphasize salient points.
- Cite specific textual evidence to support analysis of science and technical text about scale properties of objects in the solar system.
- Integrate quantitative or technical information expressed in words in a text about scale properties of objects in the solar system with a version of that information expressed visually in a flowchart, diagram, model, graph, or table.

Mathematics

- Reason quantitatively and abstractly about the sizes of an object's layers, surface features, and orbital radius where appropriate.
- Use mathematics to model the motion of the sun, moon, and stars in the sky and the role of gravity in the motions within galaxies and the solar system.
- Understand the concept of a ratio and use ratio language to describe a ratio relationship between the measurements of the cyclical motion between at least two bodies in the solar system and the relative sizes of objects and/or distances between objects and the impact of gravity on the motion of these objects.
- Recognize and represent proportional relationships between the measurement of patterns in the cyclical motion of the sun, moon, and stars in the sky and mathematical proportions relative to the sizes of objects and the effect of gravity on the motion of these objects.
- Use variables to represent numbers and write expressions when solving a problem involving the role of gravity in the motions within galaxies and within the solar system. Understand that a variable can represent an unknown number, or depending on the problem, any number in a specified set

Modifications
***As per the Recommendation of the NJDOE Science Model Curriculum**

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Unit Title: Ecosystems	Grade Level: 6	Time Frame:

Standards:

MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. [Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.] [Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.]

MS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.]

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]

Enduring Understanding:	Essential Questions:
Students understand the transfer of energy and cycling of matter including the role of photosynthesis in cycling matter in ecosystems. Organisms interact with one another to obtain the matter and energy from the ecosystem to survive and grow. They understand that sustaining life requires substantial energy and matter inputs and the structure and functions of organisms contribute to the capture, transformation, transport, release, and elimination of matter and energy.	• **How do organisms obtain and use matter and energy?** • **How do matter and energy move through an ecosystem?**

Knowledge and Skills:

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.
- Growth of organisms and population increases are limited by access to resources.
- Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.
- Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.

Demonstration of Learning/Assessment:

Unit One : Populations and Communities

Cumulating Activity: Students will complete owl pellet dissection. After completing the dissection and classifying the bones students will cite data from lab and schema to complete extension questions.

Owl Pellet Lab Activity and Rubric

Unit Two: Ecosystems and Biomes

Cumulating Activity: Students will research biome of Earth using teacher created research folder. Biomes will be selected at random. Group will than choose final project to display research from choice board.

Biome Project Board

Suggested Tasks and Activities:

Unit One: Populations and Communities

- Stations

- Biotic vs Abiotic Factors
- Classifying symbiosis
- Predator and Prey relationships
- Limiting Factors

- Lab
  Is yeast living or non-living?

- PowerPoint
  -Organisms in an Ecosystem

- BrainPOP and Study Jams

- Camouflage
- Symbiosis
- Population Growth (Limiting Factors)
- Changes in ecosystem (Succession)

- Bill Nye
  - Food Web
  - Biodiversity
- Documentary
- BBC Life: The will to survive

Unit Two: Ecosystems and Biomes

Resources:

Unit 1: Earth, Moon, and Sun Systems

BrainPOP seasons
BrainPOP Solstices and Equinoxes
BrainPOP Eclipses
BrainPOP Gravity
BrainPOP Moon phases
BrainPOP Tides
Study Jams Tides
Study Jams Gravity
Study Jams Moon
Study Jams Day on Earth
Symbaloo Tides

Unit Two : Stars, Galaxies, and the Expanding Universe

BrainPOP Scientific Notation
BrainPOP Blackholes
BrainPOP Galaxies
BrainPOP Big Bang
BrainPOP Dark Matter
BrainPOP Edwin Hubble (Telescopes)
Study Jams Universe
Pearson Scale of the Universe
Pearson Galaxies
Pearson Expanding Universe

Tech Integration:

Pearson Interactive Simulations Earth Moon and Sun Systems	• Simulations - Phet : Gravity and Tides - Symbaloo- Tides and Eclipses

Connecting English Language Arts/ Literacy and Mathematics
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English Language Arts/Literacy

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Mathematics

- Reason quantitatively and abstractly about the sizes of an object's layers, surface features, and orbital radius where appropriate.
- Use mathematics to model the motion of the sun, moon, and stars in the sky and the role of gravity in the motions within galaxies and the solar system.
- Understand the concept of a ratio and use ratio language to describe a ratio relationship between the measurements of the cyclical motion between at least two bodies in the solar system and the relative sizes of objects and/or distances between objects and the impact of gravity on the motion of these objects.
- Recognize and represent proportional relationships between the measurement of patterns in the cyclical motion of the sun, moon, and stars in the sky and mathematical proportions relative to the sizes of objects and the effect of gravity on the motion of these objects.
- Use variables to represent numbers and write expressions when solving a problem involving the role of gravity in the motions within galaxies and within the solar system. Understand that a variable can represent an unknown number, or depending on the problem, any number in a specified set

Modifications
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- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Unit Title: Earth and Human Activity	Grade Level: 6	Time Frame:

Standards:

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]

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. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth’s systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

Enduring Understanding: Students will understand the ways that human activities impact Earth's other systems. Students use several science and engineering practices to understand the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of their development.	**Essential Questions:** • ***How can natural hazards be predicted?*** • ***How do human activities affect Earth systems?***
Knowledge and Skills: • 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. • Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. • Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. • 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. • 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.	**Demonstration of Learning/Assessment:** **Culminating Activities: Students will complete Web Quest with lab groups. The web quest will illustrate how human activity and growing populations have a negative effect on the ecosystem.** Human Population Growth Web Quest **Culminating Activities: Students will have mini lesson on hurricanes. Next, teacher will first guide students on how to track data. The students will graph the remaining date in flexible grouping. Students will than use map to answer follow up questions and predict where the hurricane will go next.** Tracking Hurricane Katrina Lab
Suggested Tasks and Activities: Unit One: Resources and Living Things • **PowerPoint** Carbon Cycle and Human Activity • **Stations** Carbon-Oxygen Cycle Catastrophic Events Climate Change • **Bill Nye** Pollution Solutions	**Tech Integration:** • Phet Simulation Greenhouse Effect • National Geographic Simulation **Resources:** BrainPOP, Pearson Textbooks

• **BrainPOP** BrainPOP Carbon Cycle BrainPOP Global Warming /Greenhouse Effect • **Documentaries** Myth Busters Greenhouse Gases Billions in Change • **Labs** Elodea Lab Global Warming Simulation (Lab provided by book)	
Resources: Brainpop,	

Unit Title: Earth and Human Activity	Grade Level: 6	Time Frame:

Standards:

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]

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. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

Enduring Understanding: Students will understand the ways that human activities impact Earth's other systems. Students use several science and engineering practices to understand the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of their development.	**Essential Questions:** • ***How can natural hazards be predicted?*** • ***How do human activities affect Earth systems?***
Knowledge and Skills: • 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. • Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. • Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. • 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. • 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.	**Demonstration of Learning/Assessment:** **Culminating Activities: Students will complete Web Quest with lab groups. The web quest will illustrate how human activity and growing populations have a negative effect on the ecosystem.** Human Population Growth Web Quest **Culminating Activities: Students will have mini lesson on hurricanes. Next, teacher will first guide students on how to track data. The students will graph the remaining date in flexible grouping. Students will than use map to answer follow up questions and predict where the hurricane will go next.** Tracking Hurricane Katrina Lab
Suggested Tasks and Activities: Unit One: Resources and Living Things • **PowerPoint** Carbon Cycle and Human Activity • **Stations** Carbon-Oxygen Cycle Catastrophic Events Climate Change • **Bill Nye** Pollution Solutions	**Tech Integration:** • Phet Simulation Greenhouse Effect • National Geographic Simulation

- **BrainPOP**

BrainPOP Carbon Cycle
BrainPOP Global Warming /Greenhouse Effect

- **Documentaries**

Myth Busters Greenhouse Gases
Billions in Change

- **Labs**

Elodea Lab
Global Warming Simulation (Lab provided by book)

Connecting English Language Arts/Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy-

- Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-4),(MS-LS1-5) **RST.6-8.1**
- Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. *(MS-LS1-5)* **RST.6-8.2**
- Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-4) **RI.6.8**
- Write arguments focused on discipline content. (MS-LS1-4) **WHST.6-8.1**
- Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. *(MS-LS1-5)* **WHST.6-8.2**
- Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5) **WHST.6-8.9**

Mathematics

- Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. *(MS-LS1-4),(MS-LS1-5)* **6.SP.A.2**
- Summarize numerical data sets in relation to their context. *(MS-LS1-4),(MS-LS1-5)* **6.SP.B.4**

Modifications
***As per the Recommendation of the NJDOE Science Model Curriculum**

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies *for vignettes and explanations of the modifications.)*

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Unit Title: Waves	Grade Level: 6	Time Frame:

Standards:

MS-PS4-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.] [Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.]

MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]

MS-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. [Clarification Statement: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen.] [Assessment Boundary: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.]

Enduring Understanding:

Students will understand a simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. A sound wave needs a medium through which it is transmitted.

Essential Questions:

- What are the characteristic properties of waves?
- How do waves travel?
- How can waves be used for human benefit?

Knowledge and Skills:

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

Demonstration of Learning/Assessment:

Culminating Activity: Students will use the text book, mentor articles, and laptops to complete choice board project. Project must include:
Properties of Waves
Types of Waves
Interactions of Waves

Waves Project Board

Suggested Tasks and Activities:	**Tech Integration:**
Unit 1: Characteristics of Waves **Simulations** Pearson Properties of Waves Pearson Classification of Waves **BrainPOP** Waves **Bill Nye** Waves **Lab** Demonstration of light through different mediums (transparent, translucent, opaque) **Simulation** Bending Light Wave on a String	Resources:

Connecting English Language Arts/Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

- Cite specific textual evidence to support analysis of science and technical texts. (MS-PS4-3) **RST.6-8.1**
- 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.6-8.2**
- Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on the same topic. (MS-PS4-3) **RST.6-8.9**
- Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3) **WHST.6-8.9**
- Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS4-1),(MS-PS4-2) **SL.8.5**

Mathematics

- Reason abstractly and quantitatively. (MS-PS4-1) **MP.2**
- Model with mathematics. (MS-PS4-1) **MP.4**
- Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS4-1) **6.RP.A.1**
- Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS4-1) **6.RP.A.3**
- Recognize and represent proportional relationships between quantities. (MS-PS4-1) **7.RP.A.2**
- 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) **8.F.A.3**

Modifications
***As per the Recommendation of the NJDOE Science Model Curriculum**

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- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.

Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Pacing Guide	
Content Area: Science	
Grade Level: 7	
Unit 1: Earth and Human Activity	**September –October**
Unit 2: Earth's Systems	**November – December**
Unit 3: Energy	**January - February**
Unit 4: Motion and Stability	**March-April**
Unit 5: Weather and Climate	**May – June**

Unit Title: Earth and Human Activity	Grade Level: 7	Time Frame: 1 month

Standards:

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]

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. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth’s systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

<table>
<tr>
<td>Enduring Understanding:

Students will understand the ways that human activities impact Earth's other systems. Students use several science and engineering practices to understand the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of their development.</td>
<td>Essential Questions:

• How can natural hazards be predicted?
• How do human activities affect Earth systems?</td>
</tr>
<tr>
<td>Knowledge and Skills:
• 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.
• Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events.
• Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.
• 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.
• 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.</td>
<td>Demonstration of Learning/Assessment:
• Data Analysis
• 5 paragraph expository essay on how natural hazards can be predicted and why they should be predicted
• Digital presentation suggesting ways to monitor and minimize human impact on the environment
• Paper and pencil assessment</td>
</tr>
<tr>
<td>Suggested Tasks and Activities:
• Read texts
• Stations</td>
<td>Tech Integration:
• View video clips and visual aids
• National Geographic Human Footprint Interactive: http://nationalgeographic.org/interactive/human-footprint-interactive/
• Interactive online simulations (PHET): https://phet.colorado.edu/
o The Greenhouse Effect
• WebQuests
• Online research</td>
</tr>
<tr>
<td colspan="2">Resources:
1. Pearson Workbook: Earth's Structure (4.3), Earth's Surface (2.3), Water and Atmosphere (4.6, 5.4)</td>
</tr>
</table>

2. BrainPop:
    - Climate Change
    - Humans and the Environment
    - Conserving Energy
    - Wind Energy
    - Solar Energy
    - Fossil Fuels
    - Biofuels
    - Natural Resources
    - Greenhouse Effect
    - Air Pollution
    - Hybrid Cars
3. Study Jams:
    - Weather Instruments
4. Bill Nye Videos:
    - Pollution Solutions
5. Scholastic Magazine
6. National Geographic Human Footprint Interactive: http://nationalgeographic.org/interactive/human-footprint-interactive/
7. PHET The Greenhouse Effect Interactive Online Simulation: https://phet.colorado.edu/

Connecting English Language Arts/Literacy and Mathematics

***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

- Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-4),(MS-ESS2-2) **RST.6-8.1**
- Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS1-4)**,**(MS-ESS2-2) **WHST.6-8.2**
- 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-ESS2-3) **RST.6-8.7**
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-3) **RST.6-8.9**
- Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-1),(MS-ESS2-2) **SL.8.5**

Mathematics

- 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-ESS2-2),(MS-ESS2-3) **7.EE.B.4**
- Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-4),(MS-ESS2-2),(MS-ESS2-3) **6.EE.B.6**
- Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS1-4) **7.EE.B.6**
- Reason abstractly and quantitatively. (MS-ESS2-2),(MS-ESS2-3) **MP.2**

<u>Modifications</u>

***As per the Recommendation of the NJDOE Science Model Curriculum**

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

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Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Unit Title: Earth's Systems	Grade Level: 7	Time Frame: 6 months

Standards:

MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).]

MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]

MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.]

Enduring Understanding:	**Essential Questions:**
Students will understand how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. Students investigate the controlling properties of important materials and construct explanations based on the analysis of real geoscience data. Of special importance in both topics are the ways that geoscience processes provide resources needed by society but also cause natural hazards that present risks to society; both involve technological challenges, for the identification and development of resources and for the mitigation of hazards.	• ***How do the materials in and on Earth's crust change over time?*** • ***How does water influence weather, circulate in the oceans, and shape Earth's surface?*** • ***How do people figure out that the Earth and life on Earth have changed over time?*** • ***How does the movement of tectonic plates impact the surface of Earth?***
Knowledge and Skills: • All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. • The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.	**Demonstration of Learning/Assessment:** • Digital presentation on geological processes • Illustrate and describe the rock cycle • Illustrate and describe the water cycle • Paper and pencil assessment

- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.
- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.
- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.
- Global movements of water and its changes in form are propelled by sunlight and gravity.

Suggested Tasks and Activities:

- Read texts
- Online research
- WebQuests
- Stations
- Weathering lab
- Erosion lab
- Mineral Identification Lab
- Rock Identification Lab

Tech Integration:

- Online research
- WebQuests
- Interactive online simulations

Resources:

8. Pearson Workbook: Earth's Structure (1.1, 2.1-4, 6.1-2, 7.1-4)
9. BrainPop:

Carbon Dating	Crystals	Earth's Structure	Earthquakes
Erosion	Fossils	Geologic Time Scale	Mineral Identification
Mountains	Ocean Currents	Plate Tectonics	Rock Cycle
Soil	Types of Rocks	Volcanoes	Water
Water Cycle			

10. Study Jams:

Earthquakes	Volcanoes	Weathering & Erosion	Minerals
Igneous Rocks	Sedimentary Rocks	Metamorphic Rocks	The Rock Cycle
Soil	Fossils	Landforms	

11. Bill Nye Videos:

Earth's Crust	Evolution		

12. Cosmos: The Lost Worlds of Planet Earth
13. Foss Earth History CD
14. Foss Videos
15. Foss Lab Kit

16. Foss Reading Text: Earth History
17. Scholastic Magazine
18. National Geographic Forces of Nature Interactive: http://environment.nationalgeographic.com/environment/natural-disasters/forces-of-nature/
19. PHET Interactive Simulations (https://phet.colorado.edu/):

Plate Tectonics	Radioactive Dating	Glaciers	

20. Annenberg Learner Interactive (https://www.learner.org/interactives/):

Continents Over Time	Convergent Boundaries	Divergent Boundaries	Dynamic Earth
Geologic Timeline	Plate Interactions Challenge	Identify Rock Types	Plate & Boundaries Challenge
Volcanoes	What's Inside the Earth		

Connecting English Language Arts/Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

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Mathematics

- 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-ESS2-2),(MS-ESS2-3) **7.EE.B.4**
- Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-4),(MS-ESS2-2),(MS-ESS2-3) **6.EE.B.6**
- Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS1-4) **7.EE.B.6**
- Reason abstractly and quantitatively. (MS-ESS2-2),(MS-ESS2-3) **MP.2**

Modifications
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Unit Title: Energy	Grade Level: 7	Time Frame: 1 month

Standards:

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. [Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.]

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. [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.]

MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.]

MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.]

MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.]

Enduring Understanding:	Essential Questions:
Students will understand qualitative ideas about energy including that the interactions of objects can be explained and predicted using the concept of transfer of energy from one object or system of objects to another, and that that the total change of energy in any system is always equal to the total energy transferred into or out of the system. Students also understand that when objects are moving they have kinetic energy and that objects may also contain stored (potential) energy, depending on their relative positions. Students know the difference between energy and temperature, and begin to develop an understanding of the relationship between force and energy.	• ***How can energy be transferred from one object or system to another?***

Knowledge and Skills:	**Demonstration of Learning/Assessment:**
• 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. • A system of objects may also contain stored (potential) energy, depending on their relative positions. • When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. • 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. • Energy is spontaneously transferred out of hotter regions or objects and into colder ones.	• Graphing Activities • Solve Numerical Problems on Energy • Design a Model Solar Home • Paper and pencil assessment
Suggested Tasks and Activities: • Read texts • Stations • Lab activities	**Tech Integration:** • Interactive online simulations • View videos and visual aids

21. **Resources:** Pearson Workbook: Forces and Energy (4.1-3 and 5.1-3)
22. BrainPop:

Kinetic Energy	Potential Energy	Forms of Energy	

23. Study Jams:

Heat			

24. Foss Force and Motion CD
25. Foss Videos
26. Foss
27. Foss Reading Text: Force and Motion
28. Scholastic Magazine
29. PHET Interactive Simulations (https://phet.colorado.edu/):

Energy Forms and Changes	Energy Skate Park		

Connecting English Language Arts/Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

- Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-3) **RST.6-8.1**
- Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6) **RST.6-8.3**
- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-5) **RST.6-8.7**

- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ETS1-3) **RST.6-8.9**
- Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS1-6) (MS-ETS1-3) **WHST.6-8.7**
    - Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-5) **6.RP.A.3**

Mathematics

- Reason abstractly and quantitatively. (MS-PS1-5) (MS-ETS1-3) **MP.2**
- Model with mathematics. (MS-PS1-5) **MP.4**
- 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-ETS1-3) **7.EE.3**

Modifications

***As per the Recommendation of the NJDOE Science Model Curriculum**

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Unit Title: Motion and Stability	Grade Level: 7	Time Frame: 1 month

Standards:

MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.* [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.]

MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.]

MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. [Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.]

MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.] [*Assessment Boundary: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.*]

MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. [Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.]

Enduring Understanding:	Essential Questions:
Students will understand how to apply Newton's Third Law of Motion to relate forces to explain the motion of objects. Students also apply ideas about gravitational, electrical, and magnetic forces to explain a variety of phenomena including beginning ideas about why some materials attract each other while other repel. In particular, students develop the understanding that gravitational interactions are always attractive but that electrical and magnetic forces can be both attractive and negative. Students also develop ideas that objects can exert forces on each other even though the objects are not in contact, through fields.	• ***How can one describe physical interactions between objects and within systems of objects?***

Knowledge and Skills:

- For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law).
- The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion.
- All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared.
- Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.
- Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.

Demonstration of Learning/Assessment:

- Force and Motion Problem Solving Activities
- Magnetism Lab Activities
- Paper and Pencil Assessment

Suggested Tasks and Activities:

- Read texts
- Stations
- Videos and visual aids
- Lab activities

Tech Integration:

- View video clips and visual aids
- Interactive online simulations

Resources:

30. Pearson Workbook: Forces and Energy (1.1, 2.1-4, 6.1-2, 7.1-4)
31. BrainPop:

Acceleration	Distance, Rate, and Time	Force	Gravity
Electromagnetic Induction	Magnetism	Newton's Laws of Motion	Power
Work	Electricity	Current Electricity	Electromagnets
Static Electricity	Batteries		

32. Study Jams:

Force & Motion	Newton's First Law: Inertia	Newton's Second Law: Acceleration	Newton's Third Law: Action & Reaction
Gravity & Inertia	Electricity	Magnetism	Current Electricity & Electric Circuits

33. Bill Nye Videos:

Gravity	Magnetism	Friction	Motion

34. Foss Force and Motion CD
35. Foss Videos
36. Foss Lab Kit
37. Foss Reading Text: Force and Motion
38. Scholastic Magazine
39. PHET Interactive Simulations (https://phet.colorado.edu/):

Forces and Motion	Charges and Fields	Electric Field Hockey	Farday's Electromagnetic Lab
Magnets and Electromagnets	Ramps: Forces and Motion		

Connecting English Language Arts/Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

- Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1),(MS-ESS3-2) **RST.6-8.1**
- 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) **RST.6-8.7**
- 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.6-8.2**
- Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1) **WHST.6-8.9**

Mathematics

- Reason abstractly and quantitatively. (MS-ESS3-2) **MP.2**
- 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) **6.EE.B.6**
- Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS3-1),(MS-ESS3-2) **7.EE.B.4**

Modifications
***As per the Recommendation of the NJDOE Science Model Curriculum**

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Unit Title: Weather and Climate	Grade Level: 7	Time Frame: 2 months

Standards:

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.]

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).]

MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.]

Enduring Understanding:	**Essential Questions:**
Students will understand the factors that control weather and climate. How to examine the feedbacks between systems as energy from the sun is transferred between systems and circulates though the ocean and atmosphere.	• ***What factors interact and influence weather and climate?*** • ***How do Earth's systems interact to create weather and climate patterns?***
Knowledge and Skills: • The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. • Because these patterns are so complex, weather can only be predicted probabilistically. • Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. • Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.	**Demonstration of Learning/Assessment:** • Illustrate and explain the patterns of atmospheric and oceanic currents • Illustrate and describe the water cycle • Read weather maps and make weather predictions • Research major storms online and create digital presentations • Paper and pencil assessment

- The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.

Suggested Tasks and Activities:

- Read texts
- Stations
- WebQuests
- Videos and visual aids
- The Air Around Us Lab
- Density of Fluids Lab
- Convection in Water Lab

Tech Integration:

- Create digital presentations (PowerPoint, Prezi, etc.)
- Complete WebQuests
- View video clips and visual aids
- Online Interactives

Resources:

40. Pearson Workbook: Water and Atmosphere (1.1, 2.1, 2.3, 3.1-3.6, 4.1-6, 5.1-4)
41. BrainPop:

Climates	Global Warming	Thunderstorms	Weather
Clouds	Greenhouse Effect	Tornadoes	Wind
Earth's Atmosphere	Hurricanes	Water Cycle	Natural Disasters
Humidity			

42. Study Jams:

Weather & Climate	Weather Instruments	The Water Cycle	Severe Storms
Clouds & Precipitation	Air Masses & Fronts	Air Pressure and Wind	Earth's Oceans
Waves & Currents	Earth's Atmospehre		

43. Bill Nye Videos:

Atmosphere	Climates	Lakes and Ponds	Storms
Water Cycle			

44. Foss Weather and Water CD
45. Foss Videos
46. Foss
47. Foss Reading Text: Weather and Water
48. UCAR Center For Science Education Interactives and Simulations: http://scied.ucar.edu/interactives
49. The University of Wisconsin Weather and Climate Interactives: https://cimss.ssec.wisc.edu/wxfest/

Connecting English Language Arts/Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

- Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-4),(MS-ESS2-2) **RST.6-8.1**
- Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS1-4),(MS-ESS2-2) **WHST.6-8.2**

- 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-ESS2-3) **RST.6-8.7**
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-3) **RST.6-8.9**
- Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-1),(MS-ESS2-2) **SL.8.5**

Mathematics

- 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-ESS2-2),(MS-ESS2-3) **7.EE.B.4**
- Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-4),(MS-ESS2-2),(MS-ESS2-3) **6.EE.B.6**
- Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS1-4) **7.EE.B.6**
- Reason abstractly and quantitatively. (MS-ESS2-2),(MS-ESS2-3) **MP.2**

Modifications
***As per the Recommendation of the NJDOE Science Model Curriculum**

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- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Pacing Guide	
Content Area: Science	
Grade Level: 8	
Unit 1: Evolution	**September –November**
Unit 2: Heredity	**November – January**
Unit 3: Matter and Energy	**February - April**
Unit 4: Structure and Processes	**April - June**

Unit Title: Evolution	Grade Level: 8	Time Frame: 1 month

Standards:

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. [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.]

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. [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]

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. [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.]

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. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]

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. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.]

Enduring Understanding:	Essential Questions:
Students will understand how to analyze data from the fossil record to describe evidence of the history of life on Earth and construct explanations for similarities in organisms. They have a beginning understanding of the role of variation in natural selection and how this leads to speciation.	• ***How does genetic variation among organisms in a species affect survival and reproduction?*** • ***How does the environment influence genetic traits in populations over multiple generations?***

Knowledge and Skills:	**Demonstration of Learning/Assessment:**
• 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. • 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. • Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. • Natural selection leads to the predominance of certain traits in a population, and the suppression of others. • In *artificial* selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. • Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.	**<u>Cells & Heredity</u>** **Chap. 5: Human Genetics and Genetic Technology** Human Inheritance Human genetic disorders Advances in genetics Using genetic information *DOL: Identify some patterns of inheritance in humans* *Identify two major causes of genetic disorders in humans* *Describe three ways of producing organisms with desired traits* **Chap.6: Change over time** Darwin's Theory Evidence of Evolution Rate of Change *DOL: Describe how genetic information can be used* *Explain how natural selection leads to evolution* **<u>Diversity of Life</u>** **Chap. 7 Lesson 2** Compare/contrast embryonic development in different vertebrates
Suggested Tasks and Activities: • **Activity**: Comparing Embryo photos in connection with pg. 252-261 – Diversity of Life) • **Activity**: (Review 7th grade) relative dating – Earth history (fossil records) • **Lab:** Who's more closely related? (hands-on) • **Lab:** Genetic Engineering vs. Selective breeding	**Tech Integration:** • Smartboard visuals • Lap tops

50. **Resources:**

Connecting English Language Arts/Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

- Cite specific textual evidence to support analysis of scientific and technical texts about how genetic variations in a population increase some individuals' probability of surviving and reproducing in a specific environment. Attention must be paid to precise details of explanations or descriptions. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with information gained from reading a text on how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- Write informative/explanatory texts examining how natural selection leads to the predominance of some traits in a population and the suppression of others. Convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
- Draw evidence from informational texts to support the analysis, reflection, and research used to construct an explanation of how genetic variation of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- Engage effectively in a range of collaborative discussions with diverse partners to discuss how natural selection leads to the predominance of certain traits in a population and the suppression of others. Discussions may be one-on-one, in groups, or teacher-led; in these discussions, students should build on others' ideas while expressing their own clearly.
- Present claims and findings about how natural selection leads to the predominance of certain traits in a population and the suppression of others. Claims must emphasize salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details. Students must use appropriate eye contact, adequate volume, and clear pronunciation.
- Cite specific textual evidence to support analysis of information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms (artificial selection).
- Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others about technologies that have changed the way humans influence the inheritance of desired traits. Avoid plagiarism and provide basic bibliographic information for sources.

Mathematics

- Understand the concept of a ratio and use ratio language to describe a ratio relationship between specific genetic variations in a population and the probability of some individuals in that populations surviving and reproducing in a specific environment.
- Summarize numerical data sets about a ratio relationship between genetic variations in a population and the probability of some individuals in that population surviving and reproducing in a specific environment.
- Recognize and represent proportional relationships in trends in changes to populations over time.
- Use mathematical models to support explanations of trends in changes to populations over time.
- Understand the concept of a ratio and use ratio language to describe a ratio relationship between natural selection and decreases of specific traits in populations over time.
- Summarize numerical data sets to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Modifications
***As per the Recommendation of the NJDOE Science Model Curriculum**

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- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
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Unit Title: Heredity	Grade Level: 8	Time Frame:

Standards:

MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. [Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.]

MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

Enduring Understanding:

Students will understand how gene mutations and sexual reproduction contribute to genetic variation. Students understand how genetic factors determine the growth of an individual organism. They also demonstrate understanding of the genetic implications of sexual and asexual reproduction.

Essential Questions:

- ***What causes variation among organisms?***
- ***How does one individual's mutation increase over time in a population?***

Knowledge and Skills:

- Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.
- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.
- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each

Demonstration of Learning/Assessment:

- **Chap 3: Genetics**
  What is Heredity?
  Probability and Heredity
  Patterns of Inheritance
  Chromosomes and Inheritance
  DOL: Identify the roles of alleles in controlling the inheritance of traits
  Define probability and describe how it helps explain the results of genetic crosses.

- **Chap. 4: DNA: Code of Life**
  The genetic code
  How cells make proteins
  Mutations
  DOL: Explains what forms the genetic code
  Identify how mutations can affect an organism

Assessments: lab results, quizzes, unit test

gene, one acquired from each parent. These versions may be identical or may differ.	
Suggested Tasks and Activities: • **Lab**: Create a Simulated child (hands-on) http://www.biologyjunction.com/baby_lab.pdf • **Online visuals**: How Cell Works http://highered.mheducation.com/sites/0072495855/student_view0/chapter2/animation__how_the_cell_cycle_works.html • **Online visual:** Genetic Mutations http://learn.genetics.utah.edu/content/variation/outcomes/	**Tech Integration:** • Smartboard visuals
Resources: Cells & Heredity book, online sources	

Connecting English Language Arts Literacy and Mathematics
***AS per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

- Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-LS4-1),(MS-LS4-2),(MS-LS4-3) **RST.6-8.1**
- 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.6-8.7**
- 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) **RST.6-8.9**
- 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.6-8.2**
- Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2) **WHST.6-8.9**
- 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.8.1**
- 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) **SL.8.4**

Mathematics

- 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) **6.EE.B.6**

Modifications

***As per the Recommendation of the NJDOE Science Model Curriculum**

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- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Unit Title: Matter and Energy	Grade Level: 8	Time Frame:

Standards:

MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures. [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.]

MS-PS1-2.Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. [Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.]

MS-PS1-3.Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.]

MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. [Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.]

MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.* [Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.]

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawing and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]

Enduring Understanding:	Essential Questions:
Students will understand pure substances have characteristic properties and are made from a single type of atom or molecule. They also provide a molecular level accounts to explain states of matter and changes between states. Students provide molecular level accounts to explain that chemical reactions involve regrouping of atoms to form new substances, and that atoms rearrange during chemical reactions.	• ***How can particles combine to produce a substance with different properties?*** • ***How does thermal energy affect particles?*** • ***What happens when new materials are formed? What stays the same and what changes?***

Knowledge and Skills:	**Demonstration of Learning/Assessment:**
• Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. • Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). • Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. • Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.	• Identify the properties used to describe matter • Describe what makes up matter • Explain what physical and chemical changes are • Describe how energy changes when matter changes • Describe the motion of particles in a solid, liquid, gas • Explain what happens to a substance during state changes • Describe the modern model of the atom • Identify ways to tell that a chemical reaction has occurred **Assessment**: Lab results, lesson quizzes, unit test
Suggested Tasks and Activities: • **Lab**: Mystery Mixtures (FOSS) – 5 mini-labs • **Lab**: Heating a gas (FOSS) • **Activity**: Atom models (SmartLessons online)	**Tech Integration:** • PHET: Build an Atom • Lap tops • Smartboard
Resources: Introduction to Chemistry book	

Connecting English Language Arts/Literacy and Mathematics
***As per the Recommendation of the NJDOE Science Model Curriculum**

English Language Arts/Literacy

- Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. *(MS-PS3-1),(MS-PS3-5)* **RST.6-8.1**
- 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) **RST.6-8.7**
- Write arguments focused on discipline content. *(MS-PS3-5)* **WHST.6-8.1**
- 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) **WHST.6-8.7**
- Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. *(MS-PS3-2)* **SL.8.5**

Mathematics

- Reason abstractly and quantitatively. (MS-PS3-1),(MS-PS3-5) **MP.2**
- 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.1**
- 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) **6.RP.A.2**
- Recognize and represent proportional relationships between quantities. (MS-PS3-1),(MS-PS3-5) **7.RP.A.2**
- Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1) **8.EE.A.1**

- Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, 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.EE.A.2**
- 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),(MS-PS3-5) **8.F.A.3**

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Unit Title: Structure and Processes	Grade Level: 8	Time Frame:

Standards:

MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.]

MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]

MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.]

MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.]

MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. [Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.]

MS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.]

MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

Enduring Understanding:	Essential Questions:
Students will understand all organisms are made of cells, and that special structures are responsible for particular functions in organisms. For many organisms, the body is a system of multiple interacting subsystems that form a hierarchy from cells to the body. Organisms gather and use information from the environment.	• ***How do the structures of organisms contribute to life's functions?***

Knowledge and Skills:

- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).
- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.
- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.
- Animals engage in characteristic behaviors that increase the odds of reproduction.
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.
- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.
- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy.

Demonstration of Learning/Assessment:

Diversity of Life

- List the characteristics all living things share
- Identify what all living things needs to survive
- Identify the characteristics that all plants share
- Name all the things that a plant needs to live successfully on land
- Describe the functions of roots, stems, leaves
- Describe how plants reproduce
- Compare asexual and sexual reproduction

Cells & Heredity

- Describe the functions of cell structures and organelles
- Explain how living things get energy from the sun
- Describe what happens during photosynthesis
- Describe the events that occur during cellular respiration

Assessments:
Lab results, quizzes, Photosynthesis vs Cellular respiration project, unit test

Suggested Tasks and Activities:

- **Lab**: Determine which is living (hands-on)
- **Lab**: Photosynthesis in Elodea (hand-on)
- **Project**: Photosynthesis vs. Cellular respiration presentation
- **Web quest** (online): http://www.usv.k12.oh.us/Downloads/photosysnthesis%20webquest12.pdf

Tech Integration:

- Smartboard
- Lap tops – prezi demonstration

Resources: Diversity of Life, Cells & Heredity

Connecting with English Language Arts/Literacy and Mathematics
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English Language Arts

- Conduct a short research project collecting evidence that living things are made of cells to answer a question (including a self-generated question). Draw on several sources and generate additional related, focused questions that allow for multiple avenues of exploration.

- Integrate multimedia and visual displays of cells and specific cell parts into presentations to clarify information, strengthen claims and evidence, and add interest.

Mathematics

- Use variables to represent two quantities, such as the number of cells that makes up an organism and units representing the size or type of the organism, and determine the relationship between these two variables.
- Write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.
- Use variables to represent two quantities in a real-world problem that change in relationship to one another—for example, determining the ratio of a cell's surface area to its volume. Write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

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